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Okui et al.

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(45) **Date of Patent: Jul. 4, 2023**

(54) **LIQUID EJECTING APPARATUS AND METHOD OF FIXING LIQUID EJECTING HEAD**

(71) Applicant: **Seiko Epson Corporation**, Tokyo (JP)

(72) Inventors: **Hiroaki Okui**, Azumino (JP); **Eiichiro Watanabe**, Matsumoto (JP)

(73) Assignee: **SEIKO EPSON CORPORATION**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **17/573,668**

(22) Filed: **Jan. 12, 2022**

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(30) **Foreign Application Priority Data**

Jan. 13, 2021 (JP) 2021-003211

(51) **Int. Cl.**
B41J 25/34 (2006.01)
B41J 2/01 (2006.01)
B41J 2/145 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 25/34*** (2013.01); ***B41J 2/01*** (2013.01); ***B41J 2/145*** (2013.01); *B41J 2202/20* (2013.01); *B41J 2202/21* (2013.01)

(58) **Field of Classification Search**
CPC B41J 25/34; B41J 2/01; B41J 2/145; B41J 2202/20; B41J 2202/21
See application file for complete search history.

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(74) *Attorney, Agent, or Firm* — Harness, Dickey & Pierce, P.L.C.

(57) **ABSTRACT**

A liquid ejecting apparatus includes a liquid ejecting head, a holding member holding the liquid ejecting head, a fixing member including a head portion, an engaging portion, and a shaft portion that couples the head portion to the engaging portion, and an elastic member including a first opening into which the shaft portion is inserted. One of the liquid ejecting head and the holding member includes a second opening into which the shaft portion is inserted, and the other one of the liquid ejecting head and the holding member includes a first engaged portion to be engaged with the engaging portion. The liquid ejecting head is fixed to the holding member by the engaging portion being brought into engagement with the first engaged portion such that the first opening and the second opening are disposed between the head portion and the engaging portion.

19 Claims, 23 Drawing Sheets

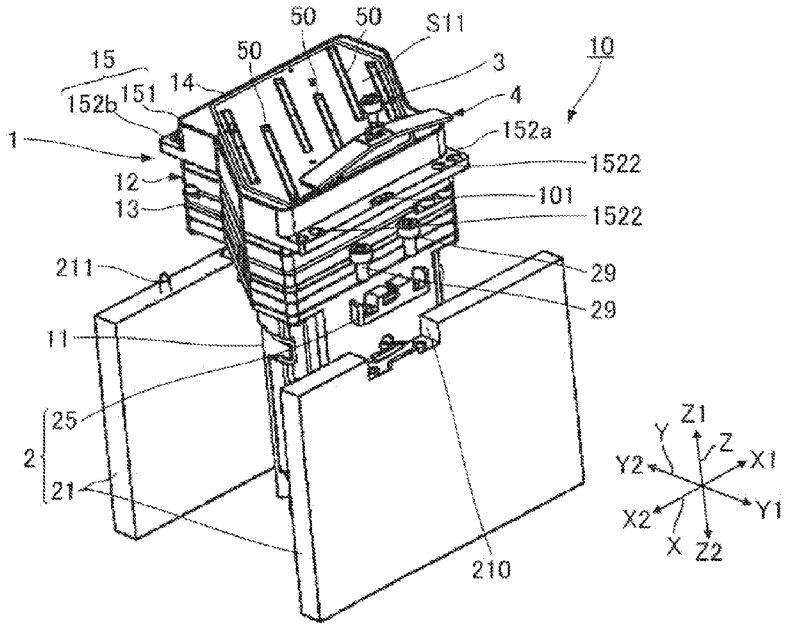


FIG. 1

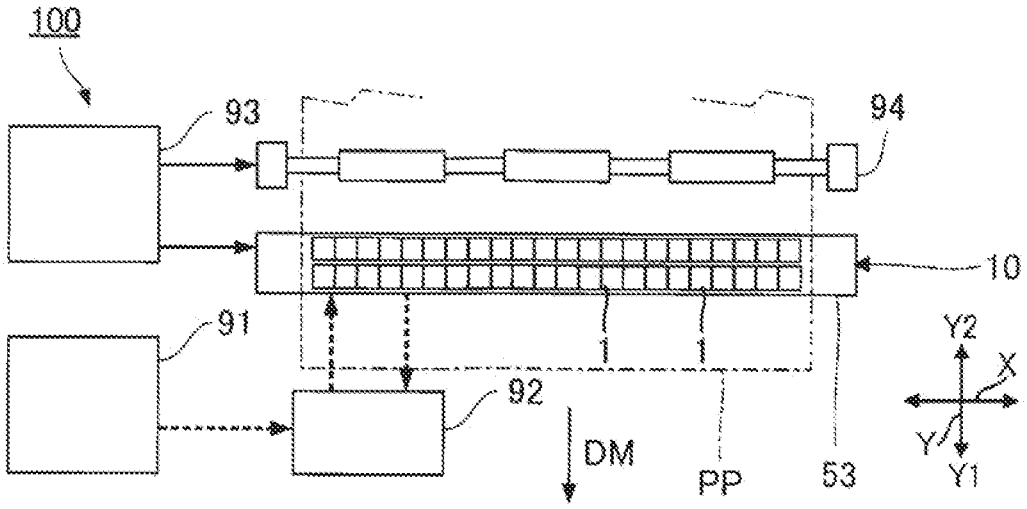


FIG. 2

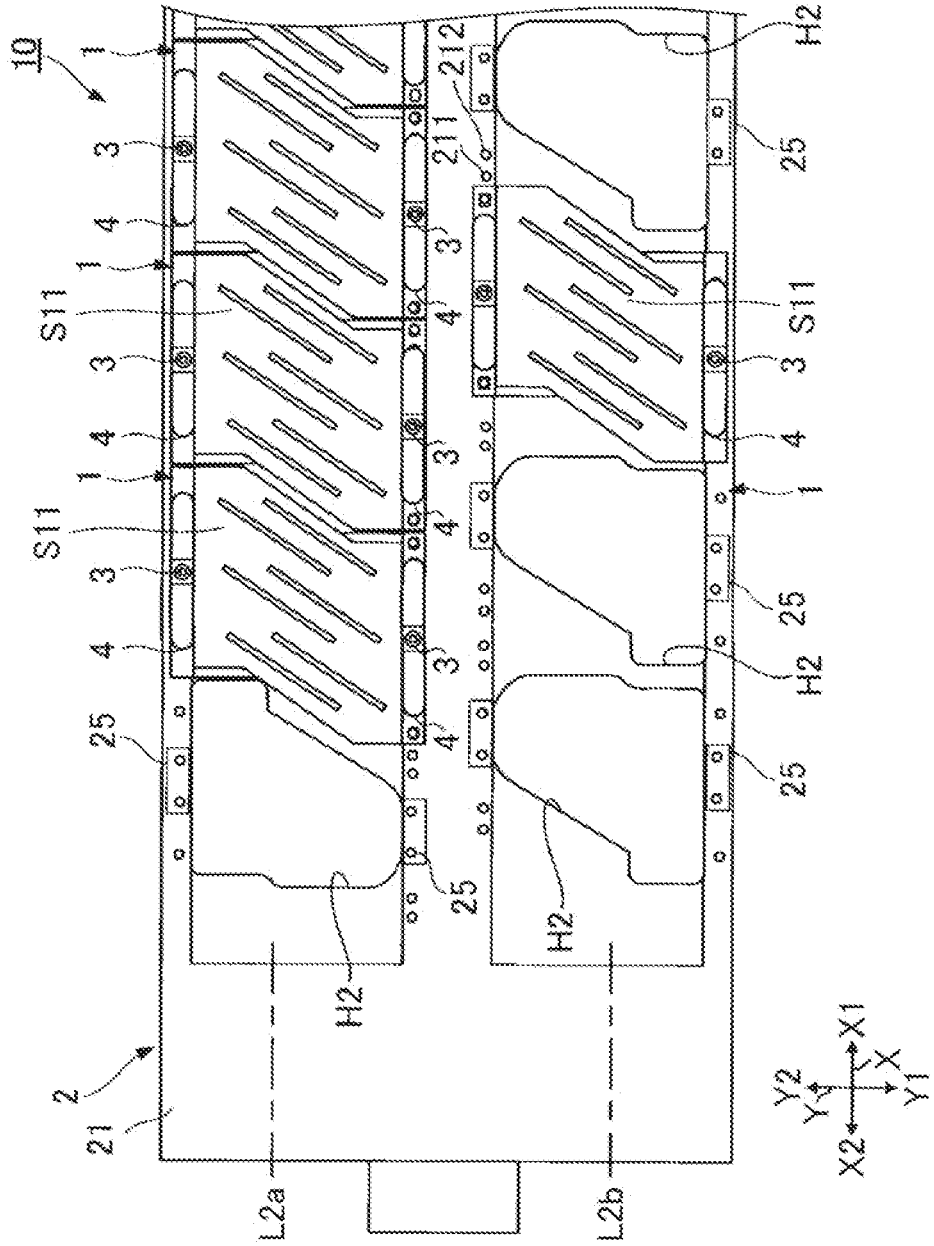
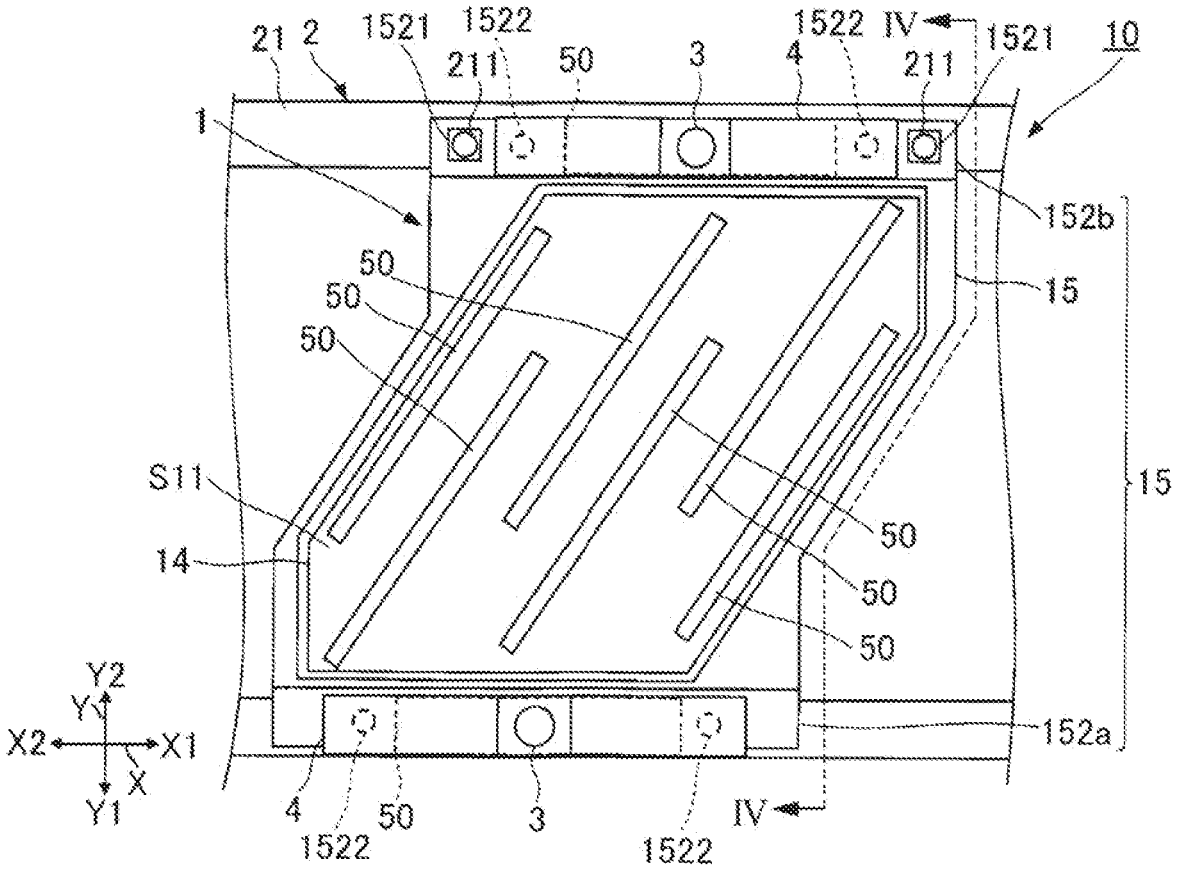


FIG. 3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IV
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S11
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152a
Y2
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X2
X1
X
Y1
4
1522
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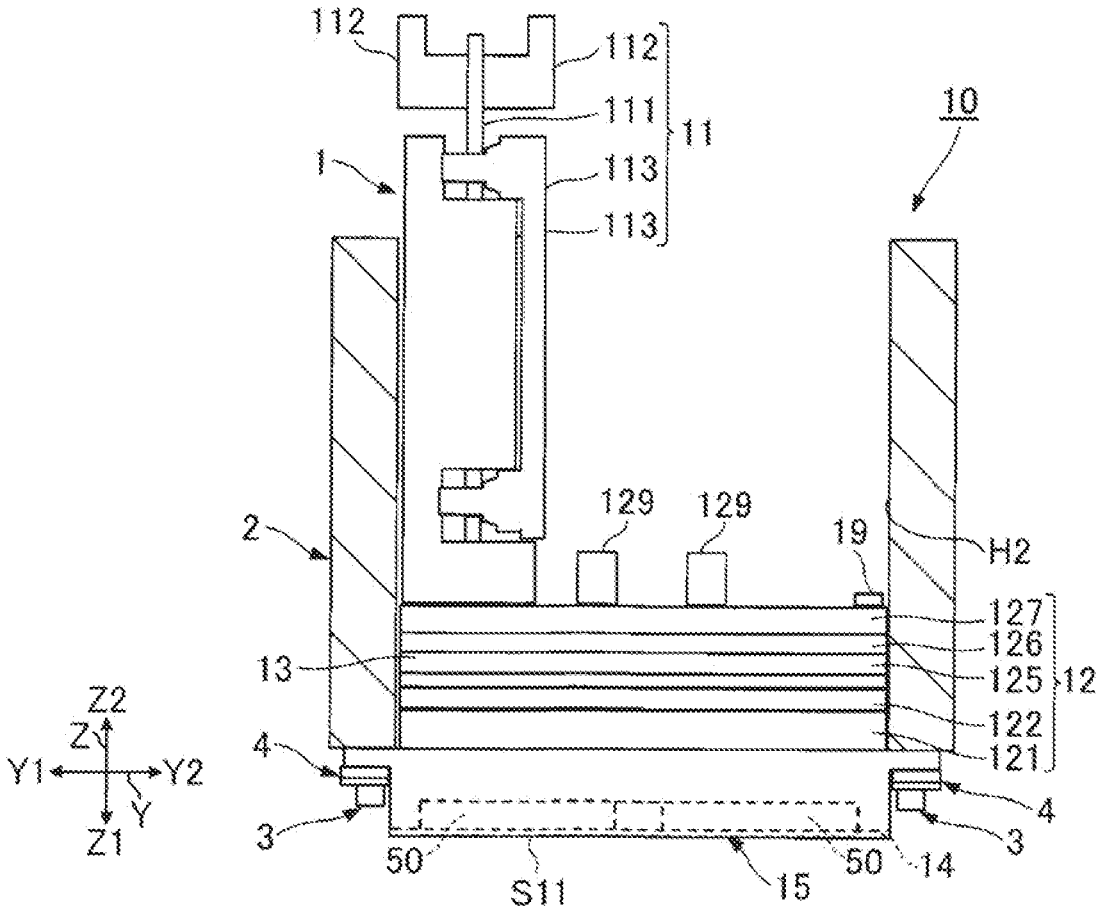
1522
IV

FIG. 4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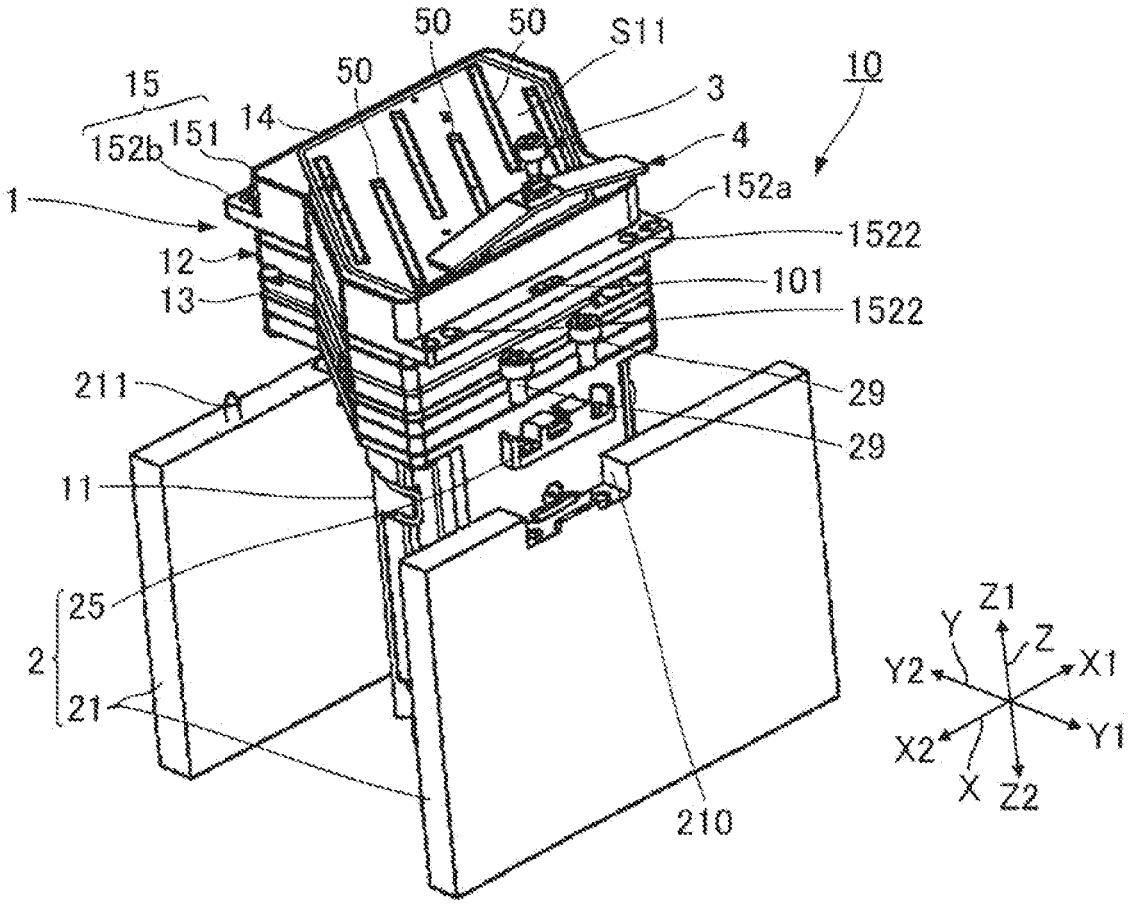
14
S11
15
Z2
Z
Y1
Y2
Y
Z1

FIG. 5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Z1
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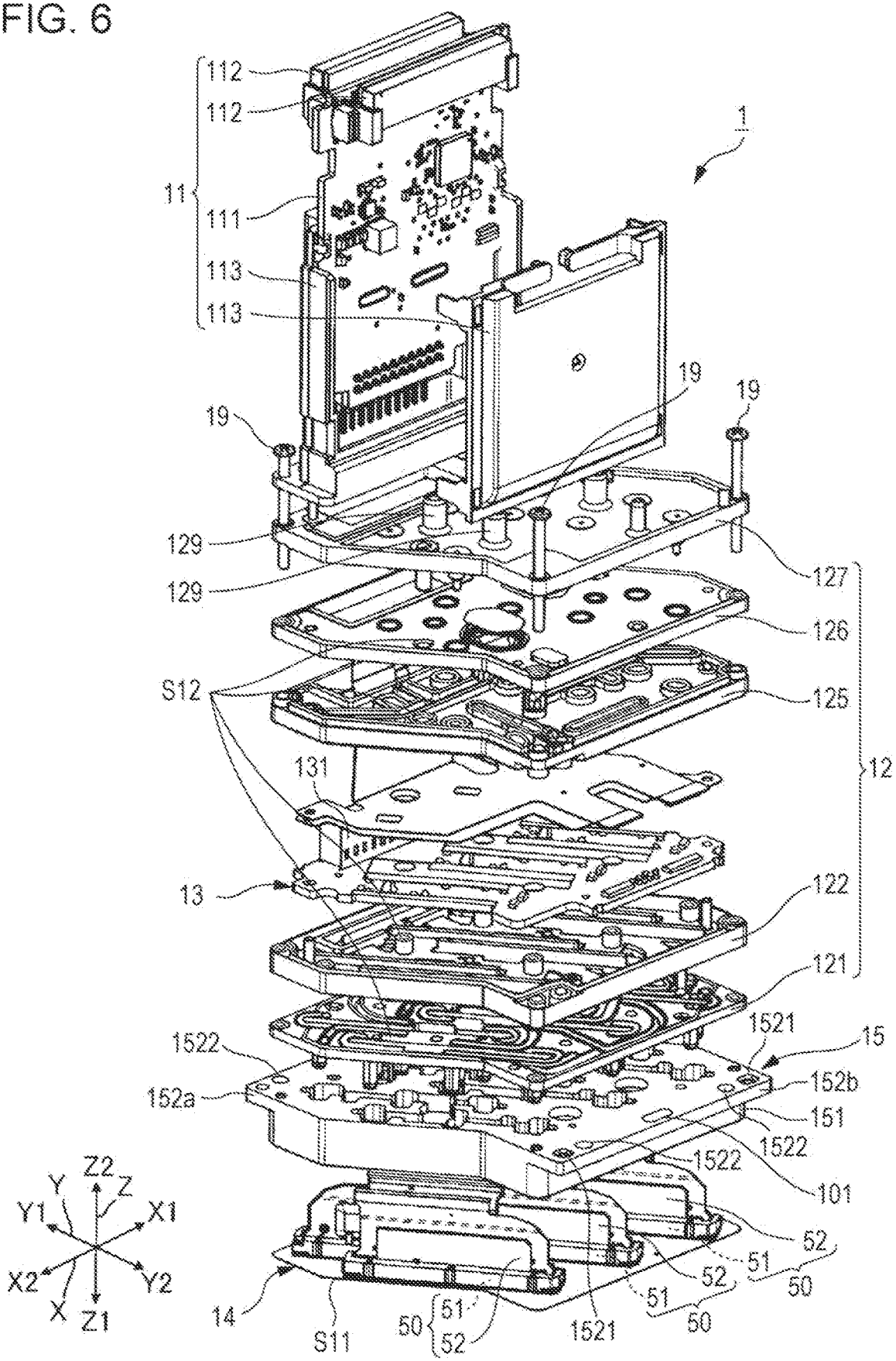
Z
Y2
X1
X2
Y1
X
Z2

FIG. 6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15
1522
152b
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S11
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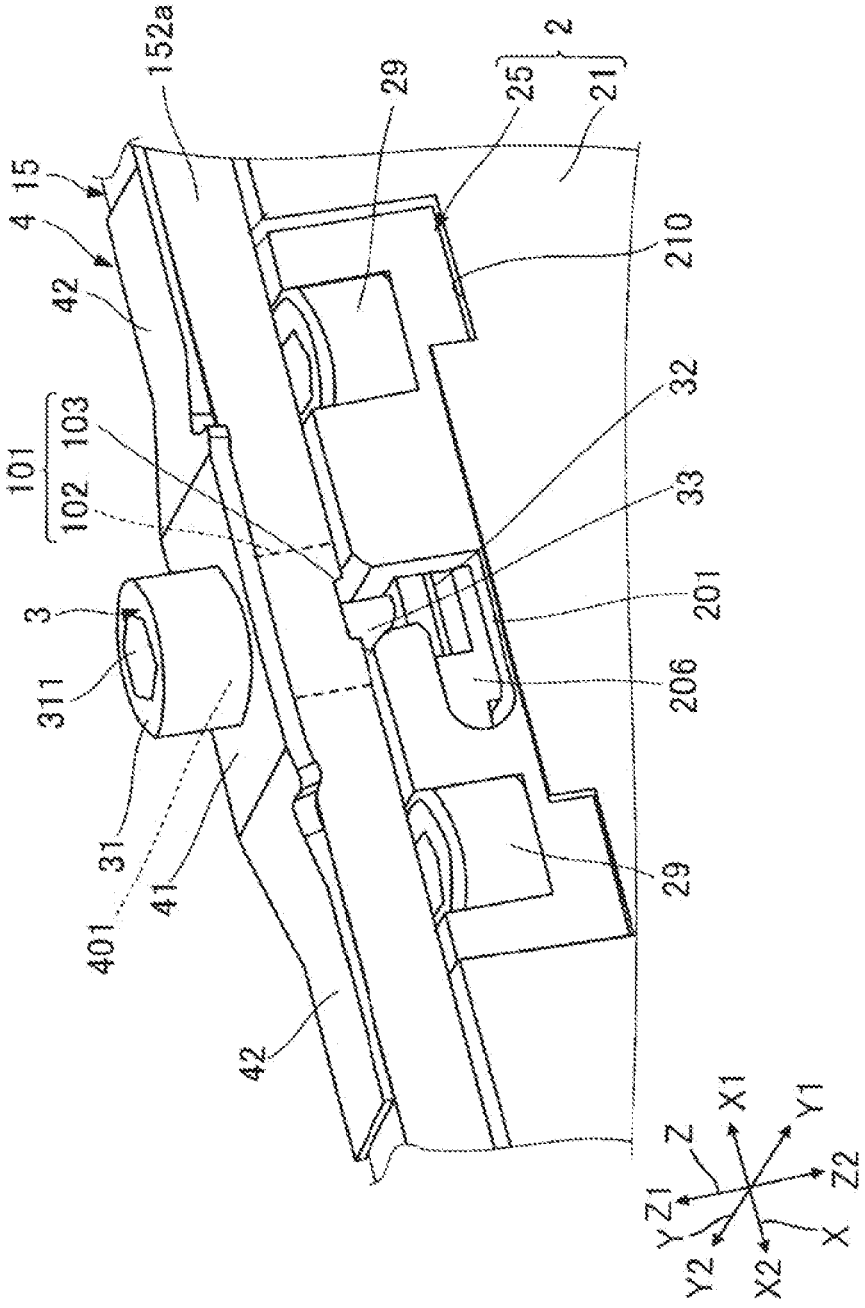
FIG. 7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101
103
102
33
3
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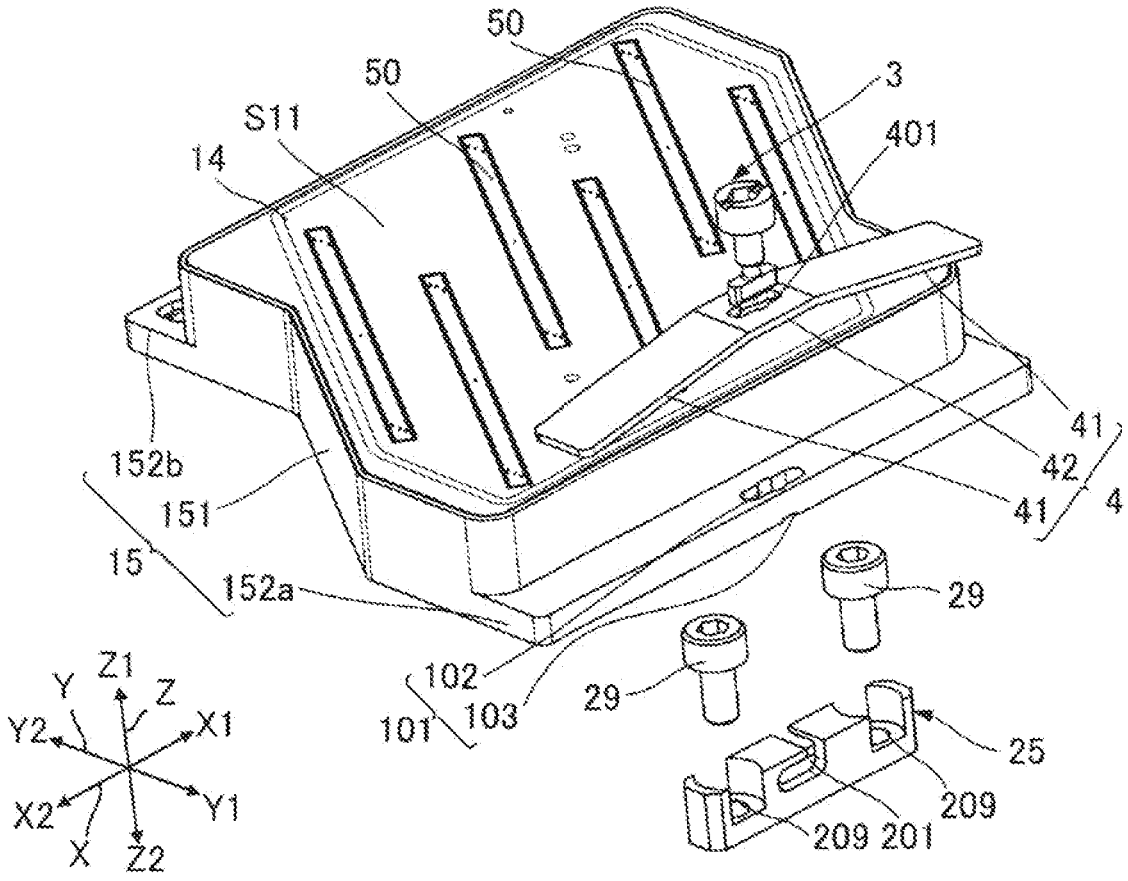
Z1
Z2
Y
X
Y2
X2

FIG. 8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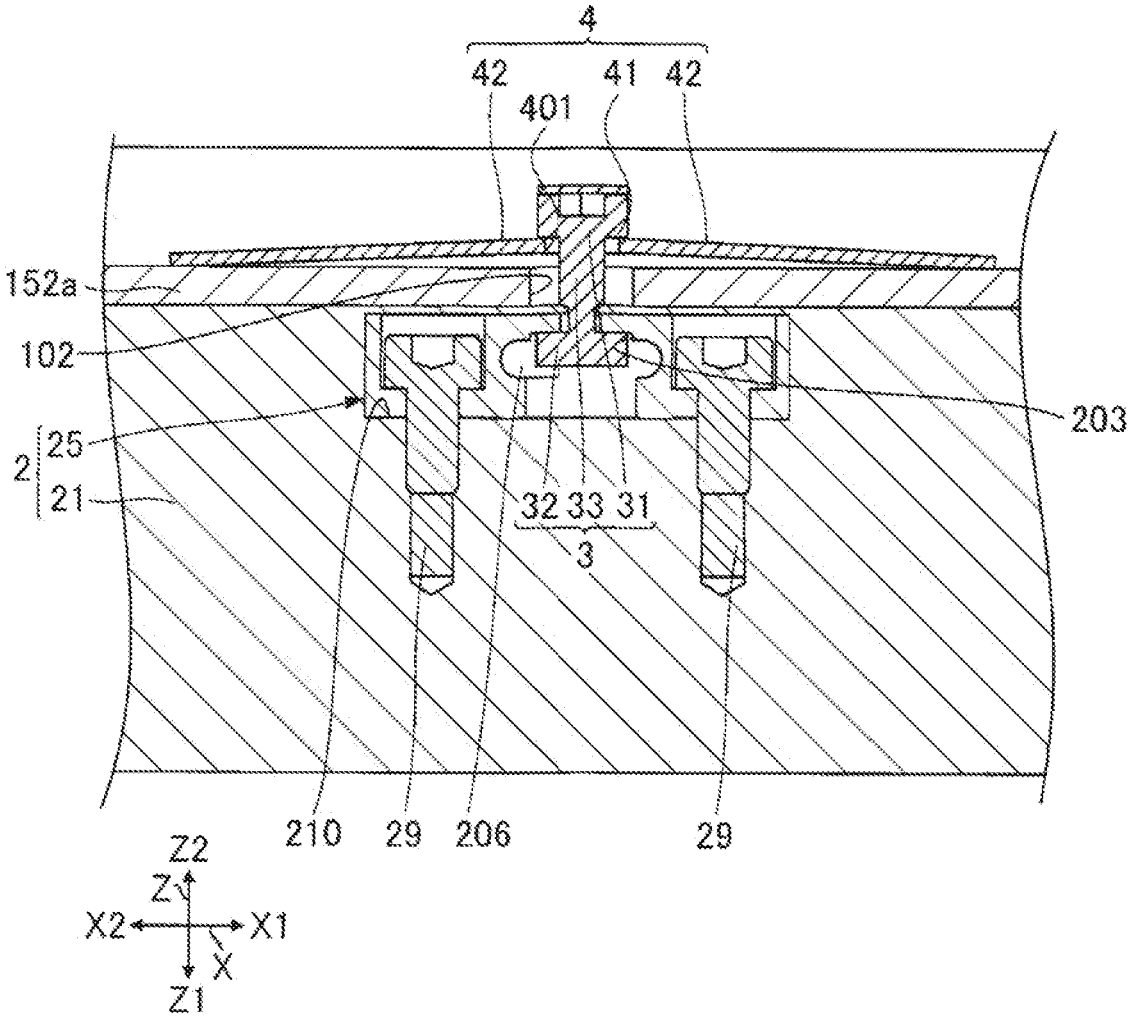
Z1
Y
Z
Y2
X1
X2
Y1
X
Z2

FIG. 9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152a
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32 33 31
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Z2
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X2
X1
X
Z1

FIG. 10

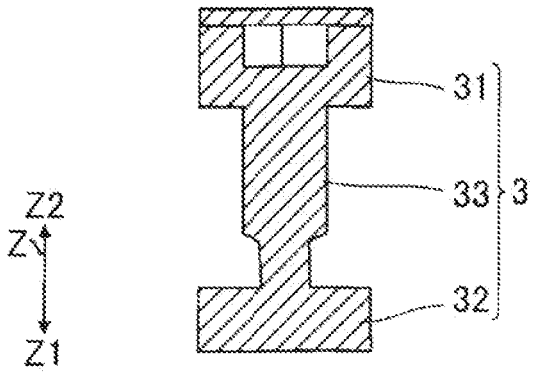


FIG. 11

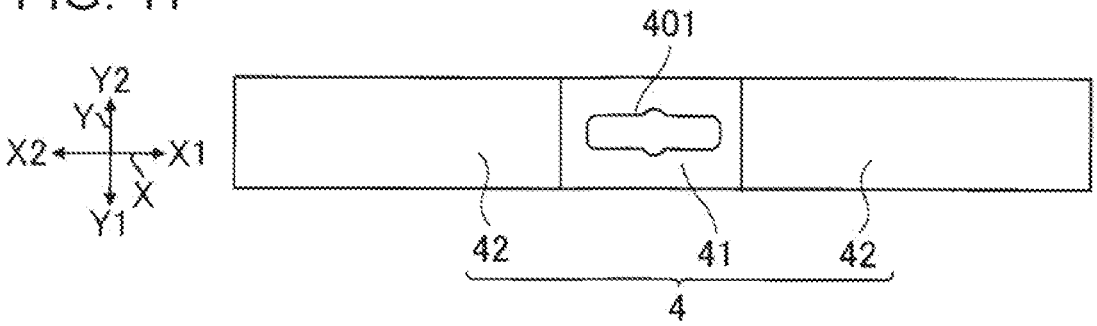


FIG. 12

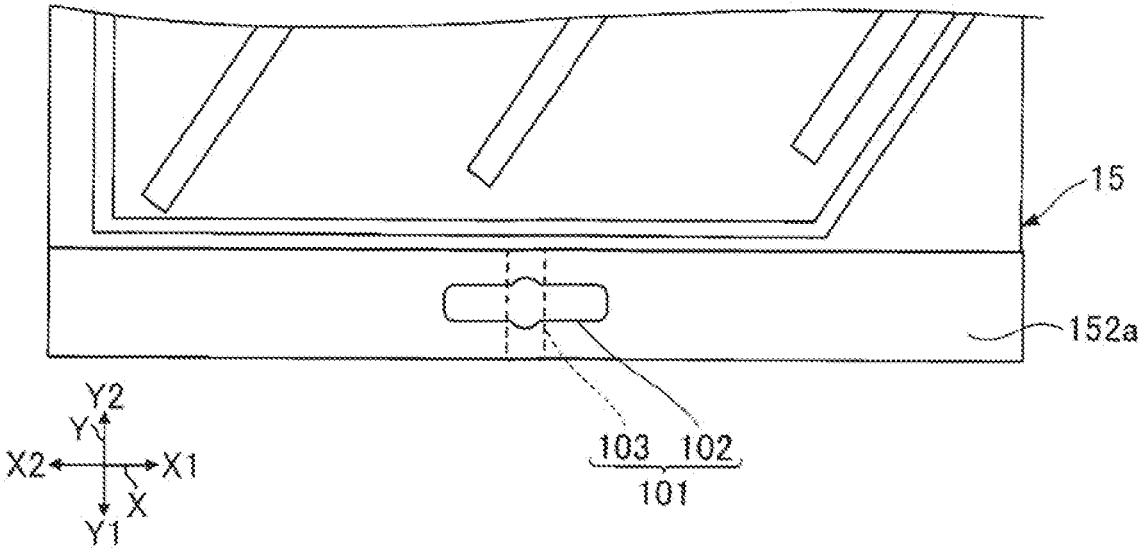
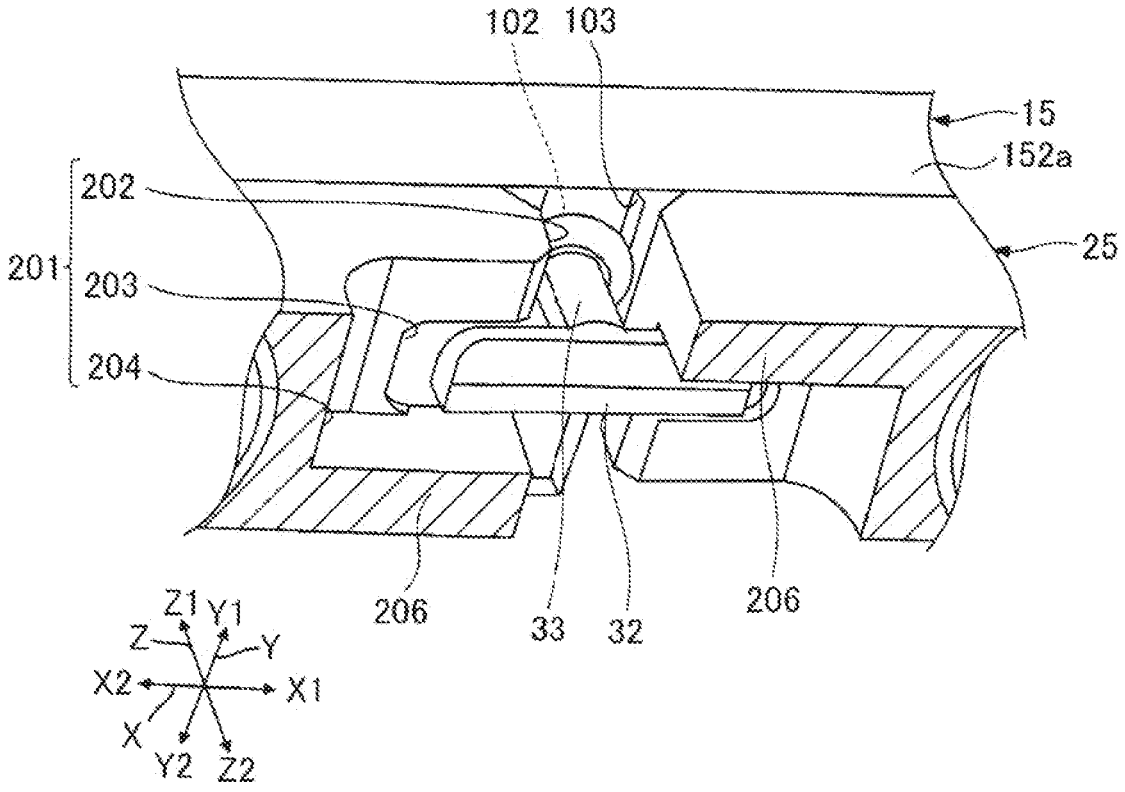


FIG. 13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152a
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32
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Z1
Y1
Z
Y
X2
X1
X
Y2
Z2

FIG. 14

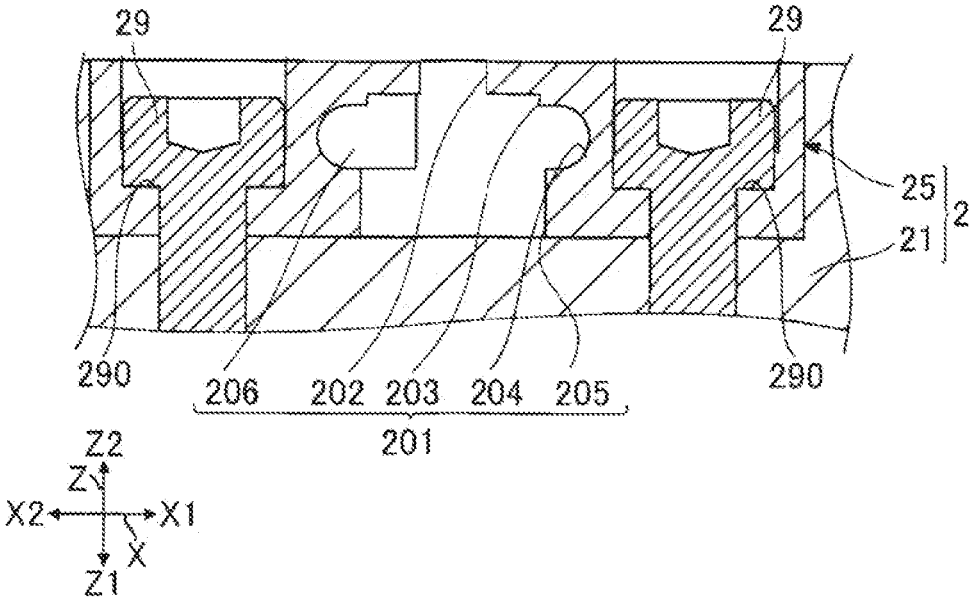
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FIG. 15

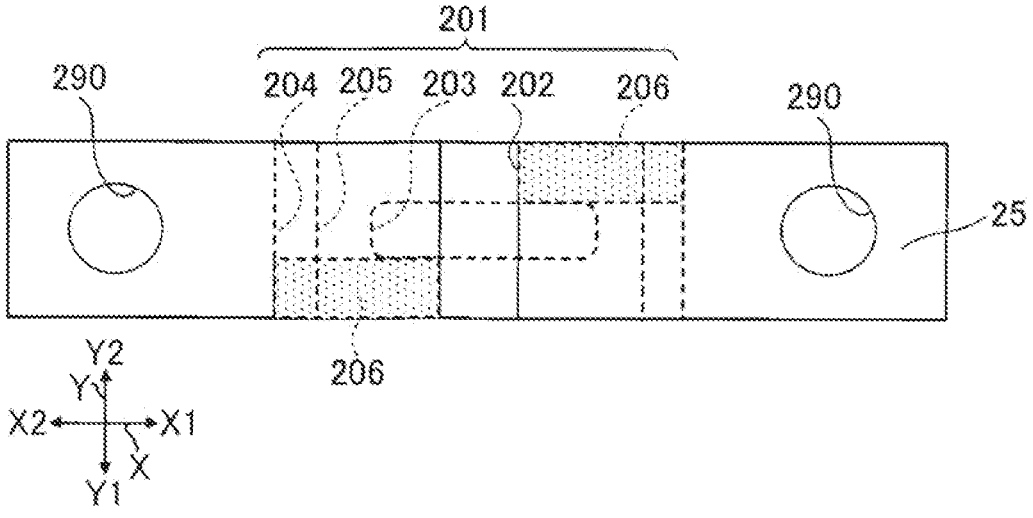
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FIG. 16

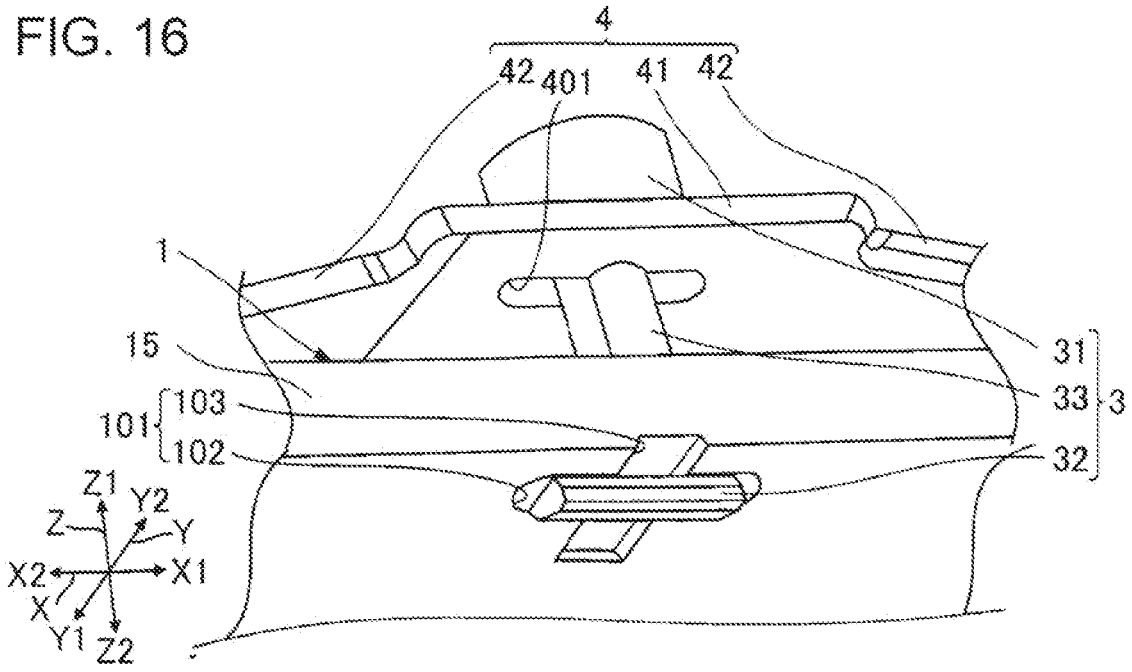
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FIG. 17

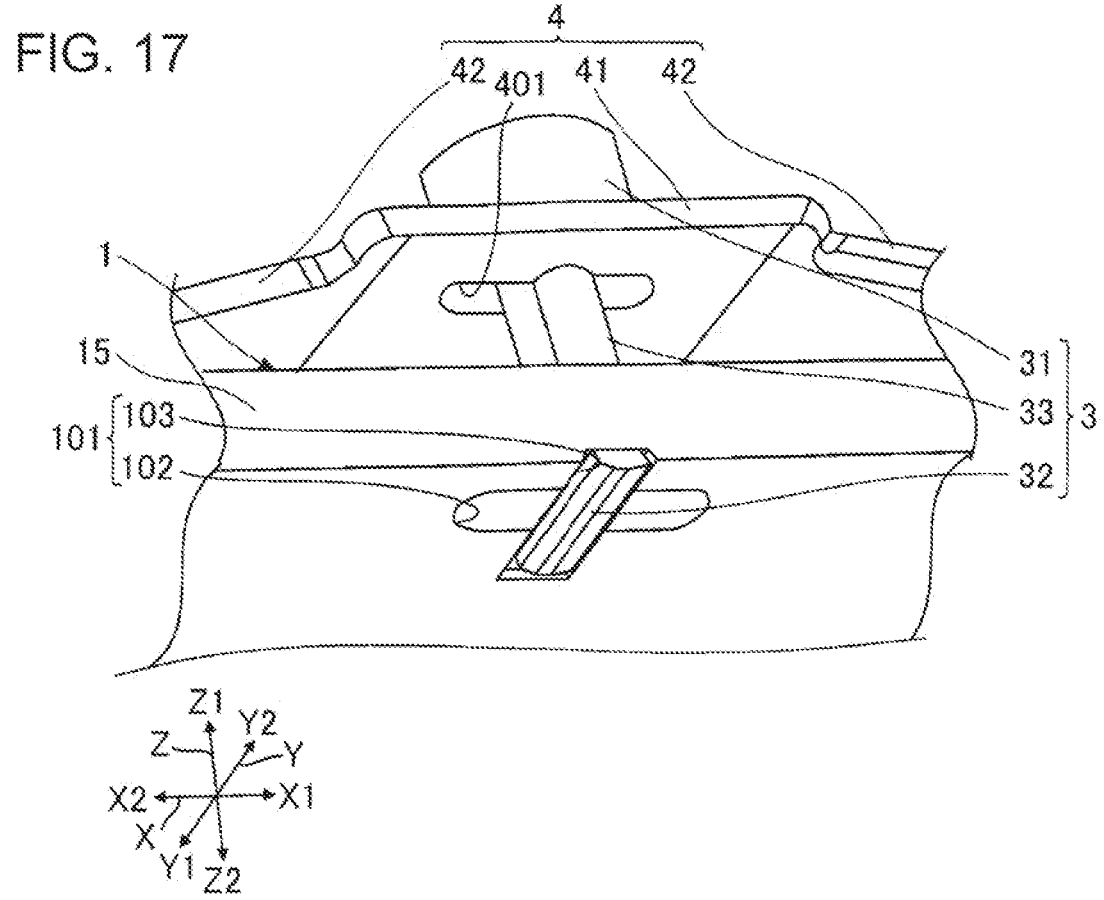
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FIG. 18

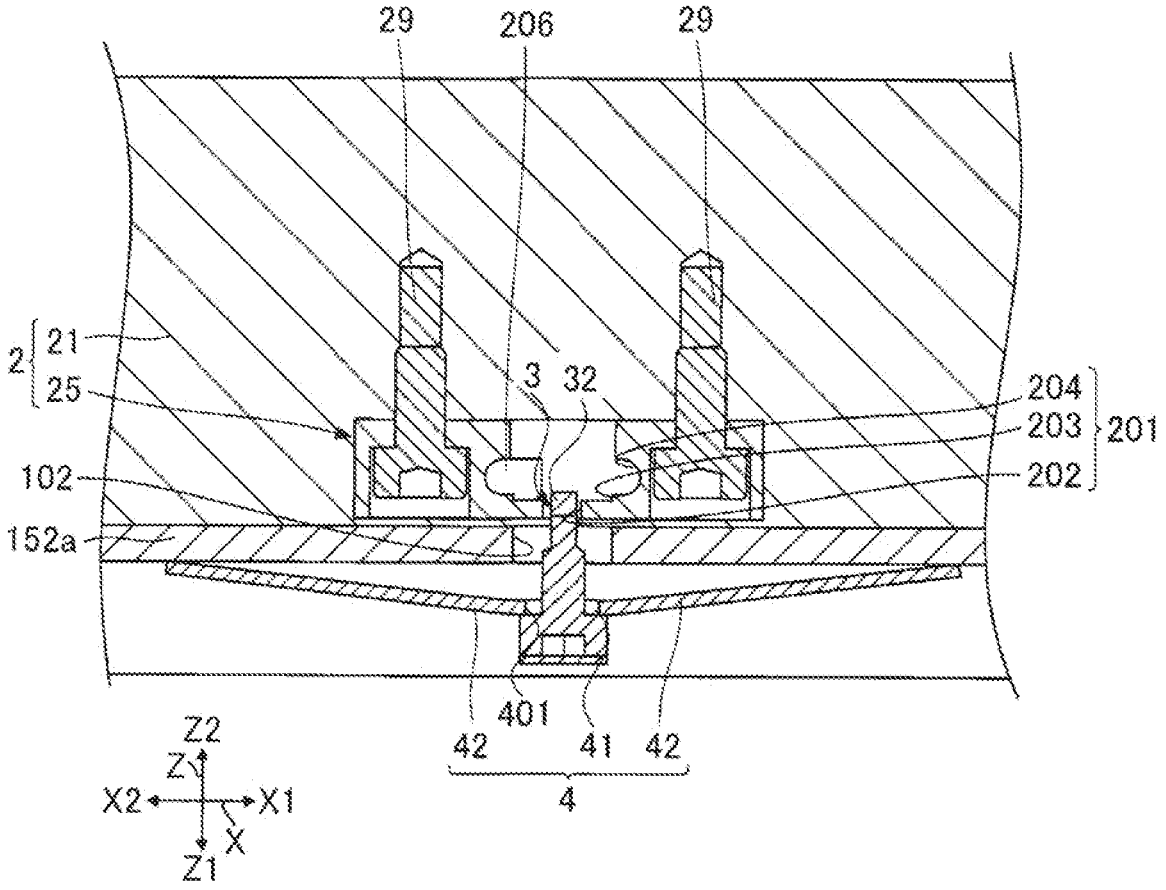
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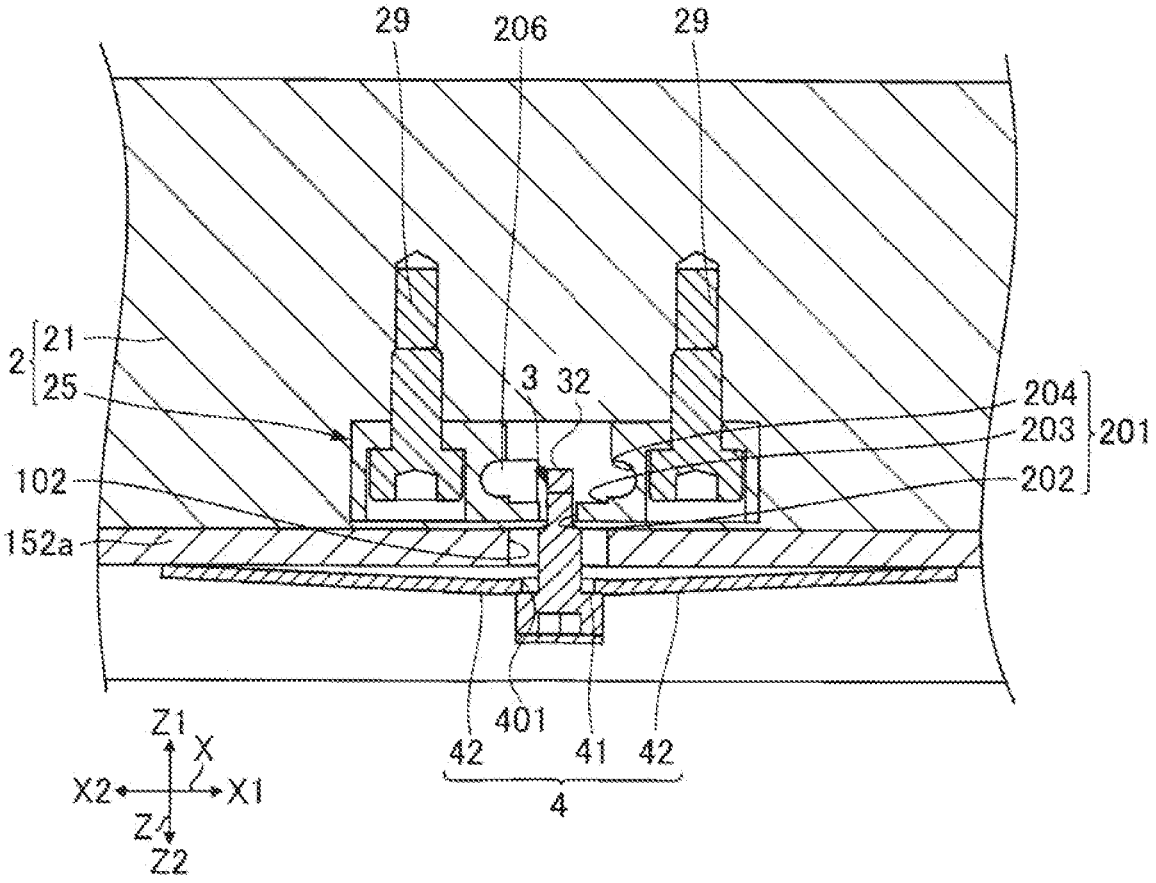
FIG. 19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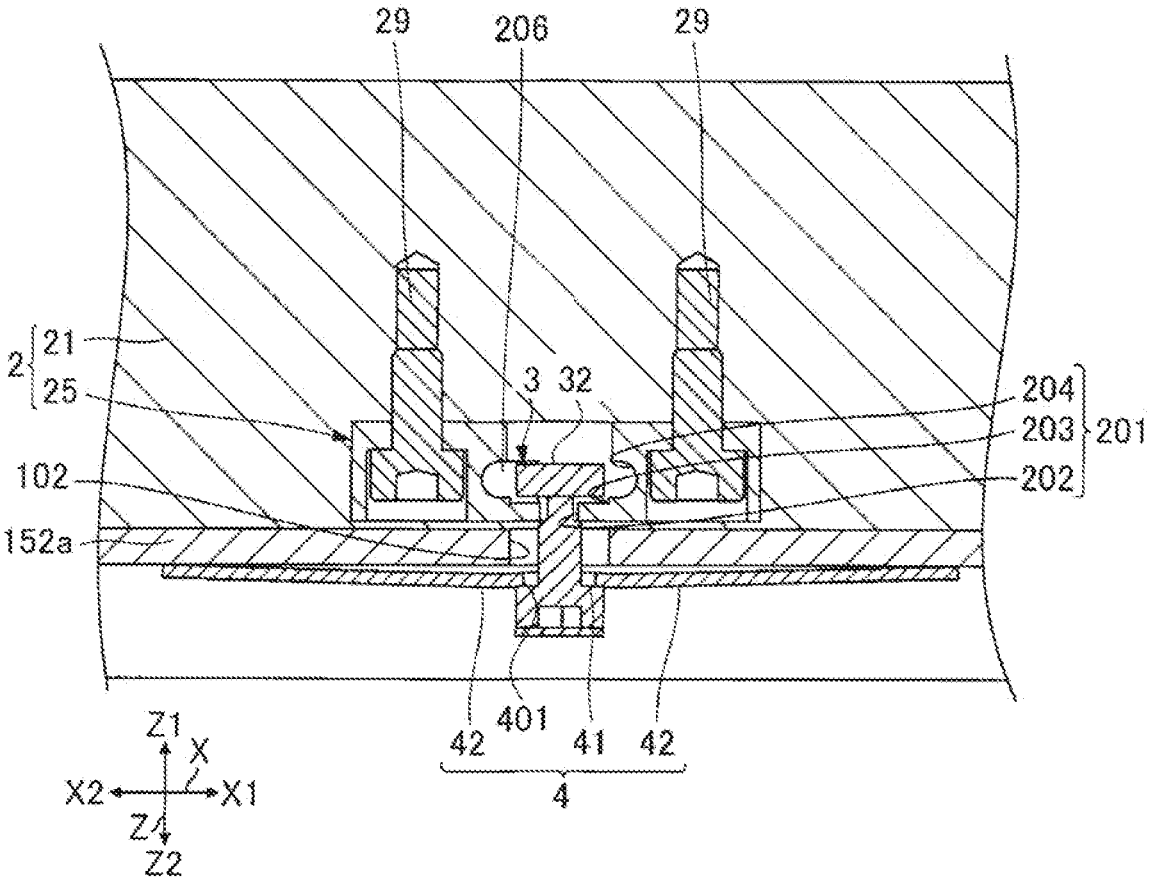
X2
X1
Z
Z2

FIG. 20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X1
Z
Z2

FIG. 21

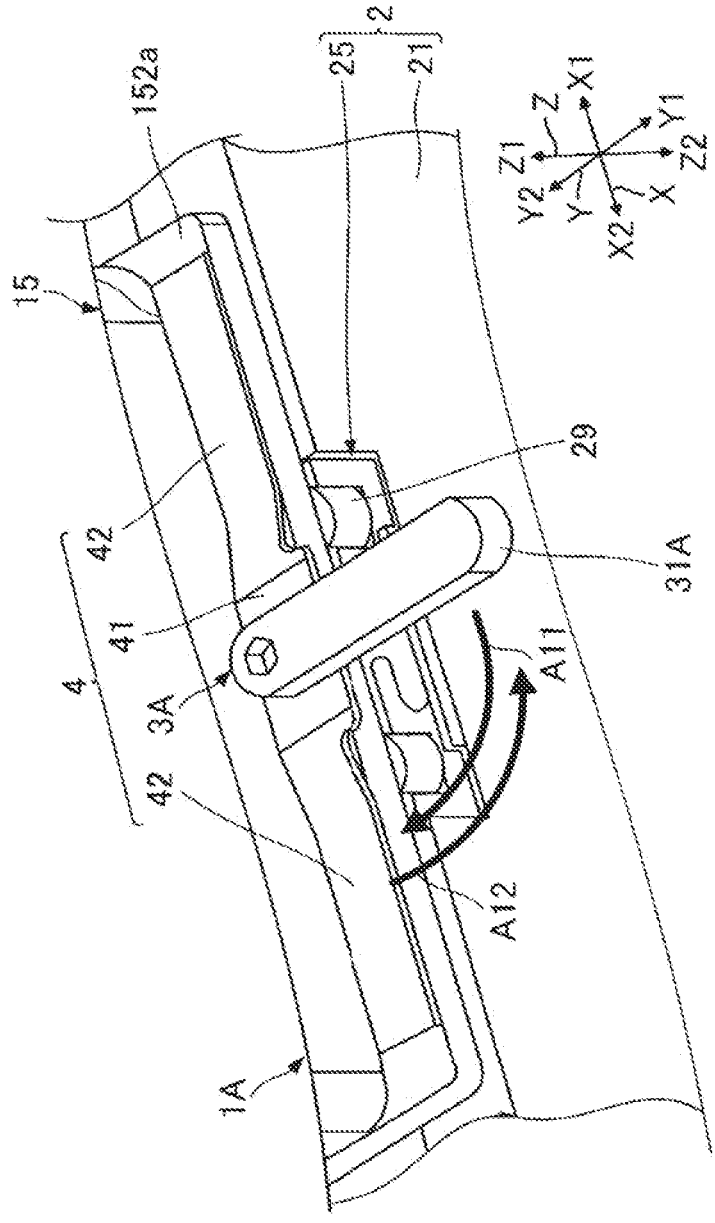
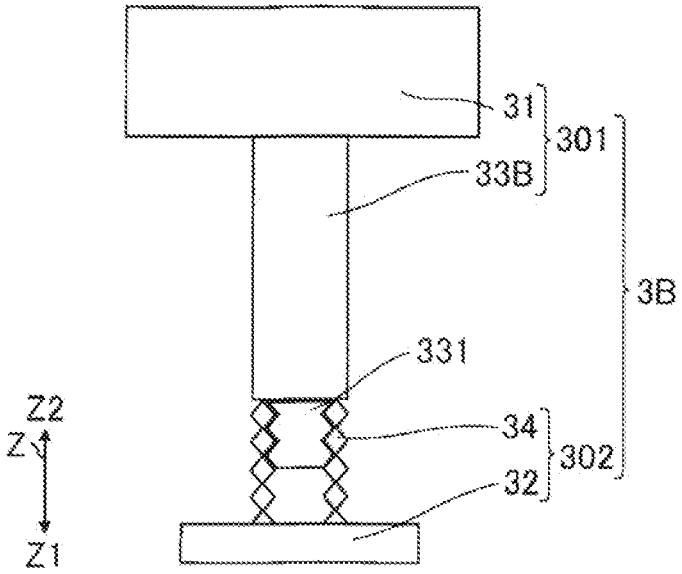


FIG. 22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301
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Z2
Z
Z1

FIG. 23

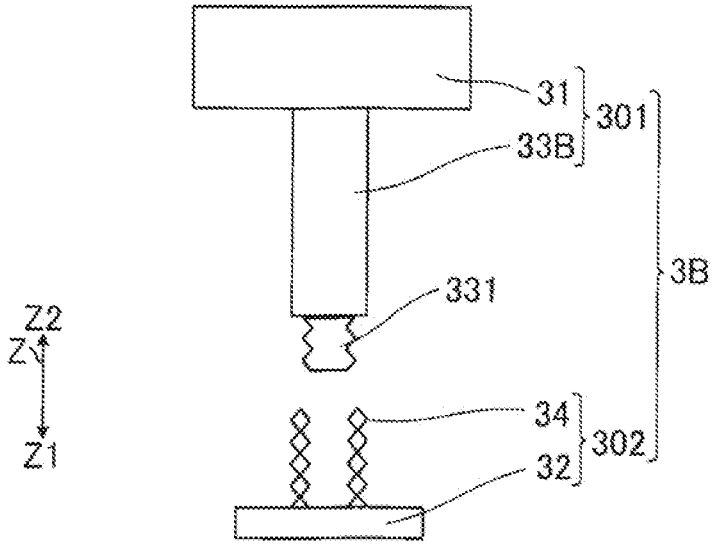
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FIG. 24

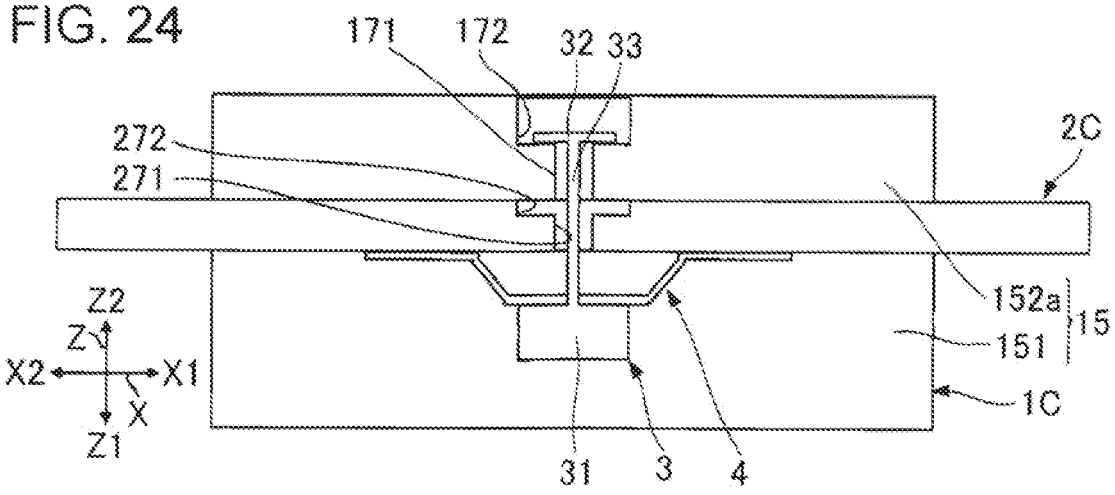


FIG. 25

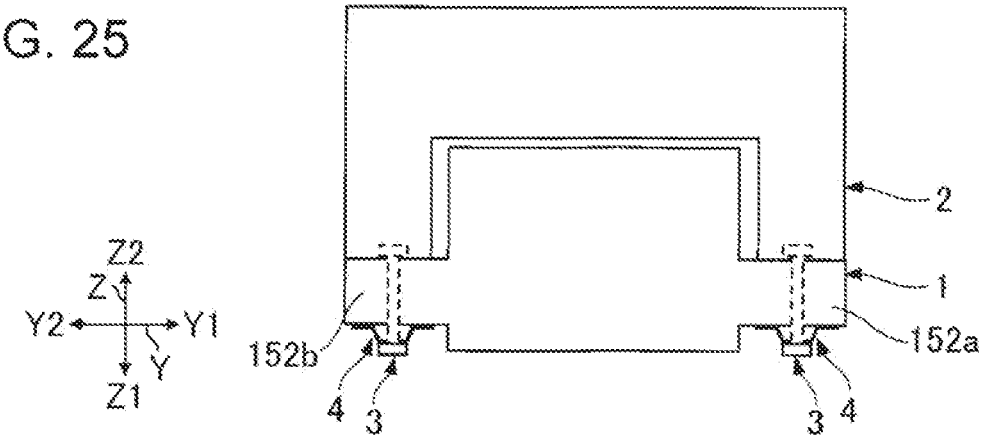


FIG. 26

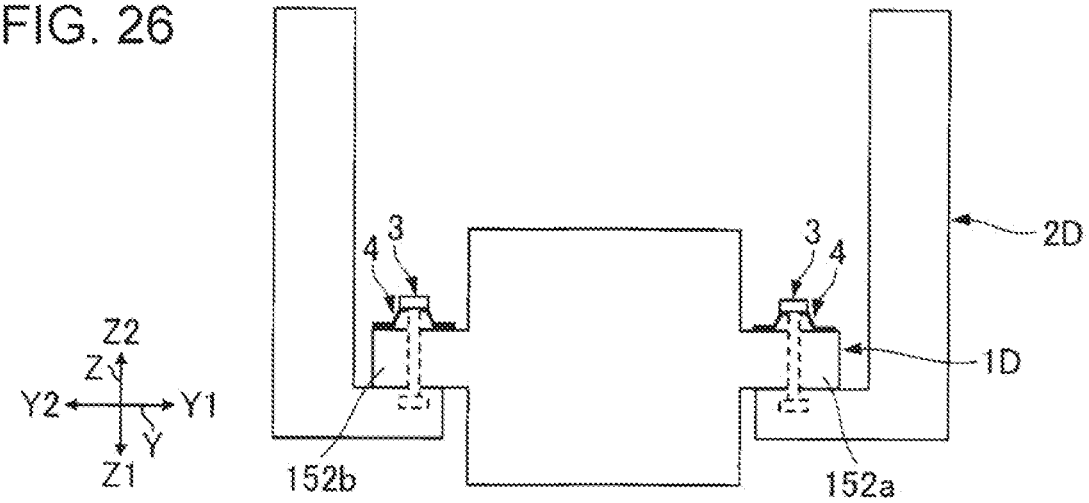


FIG. 27

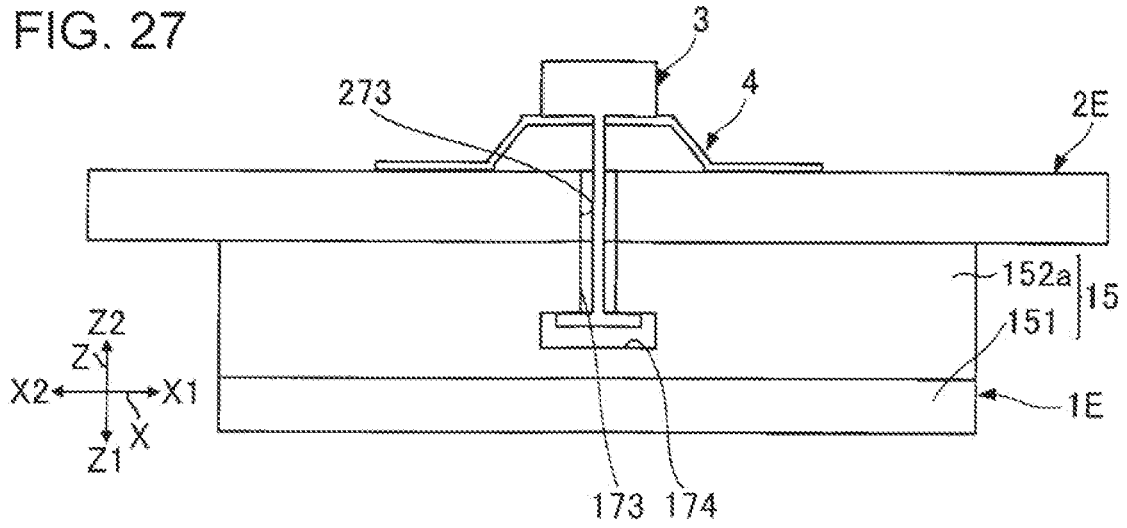


FIG. 28

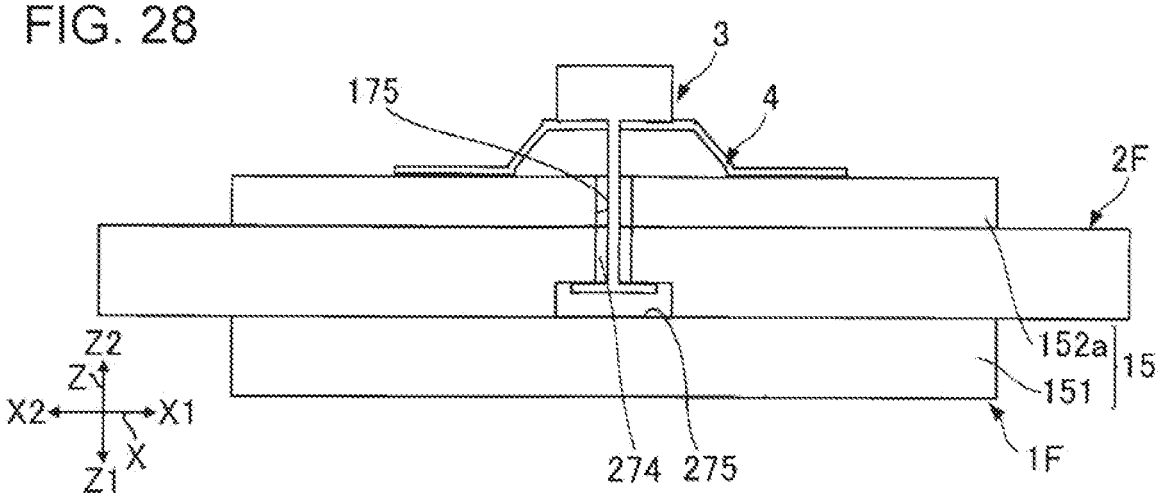


FIG. 29

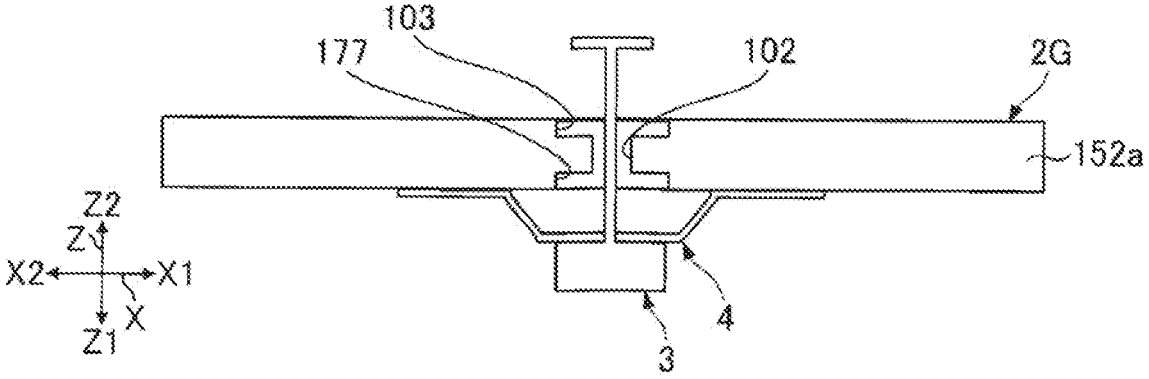


FIG. 30

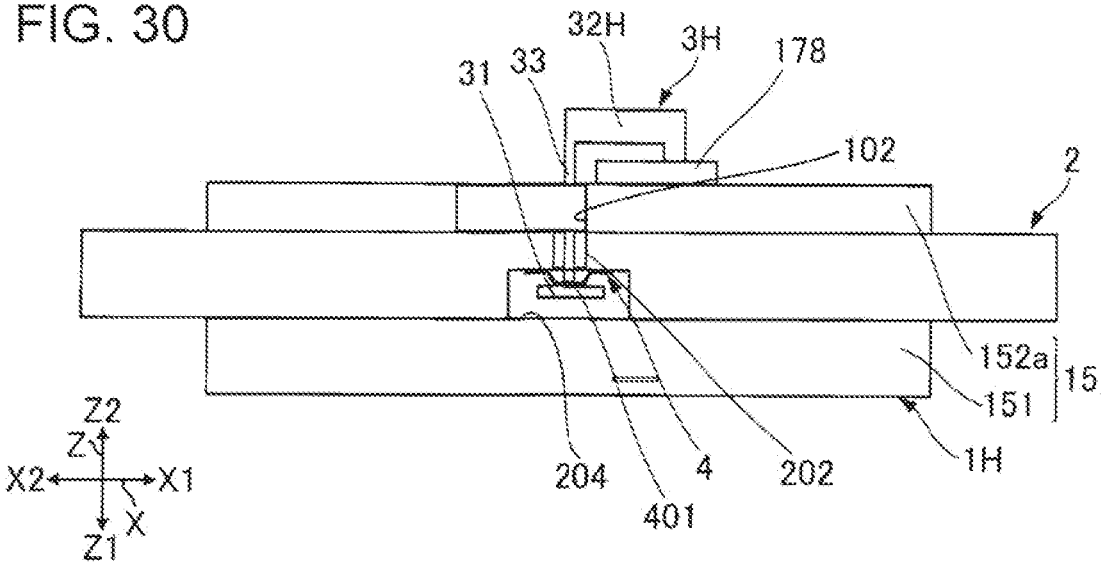


FIG. 31

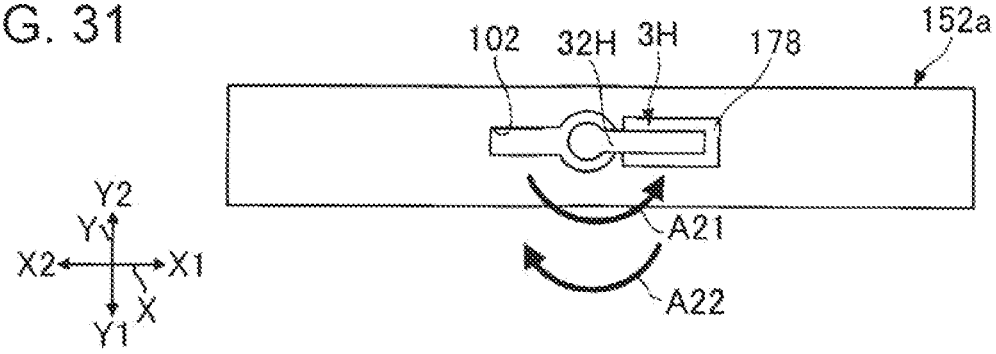


FIG. 32

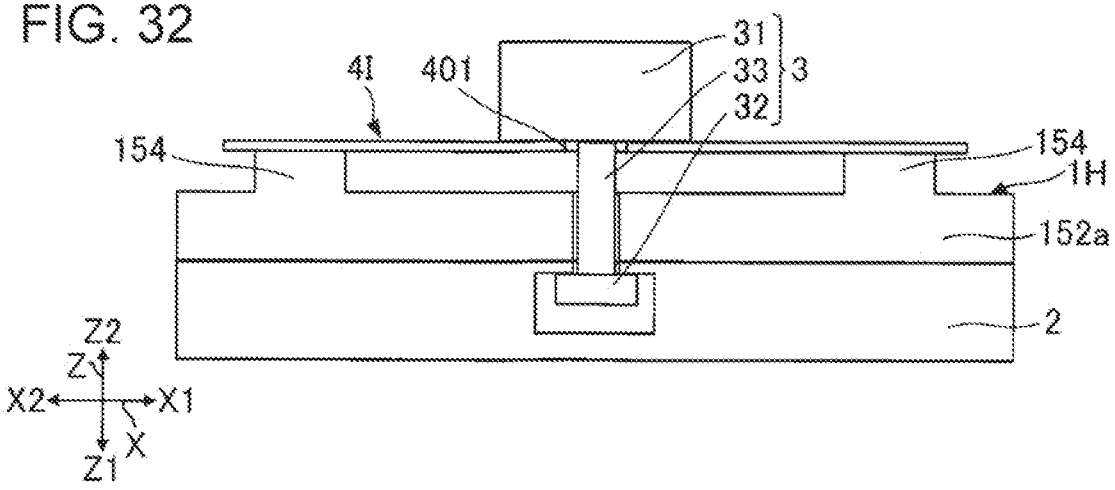
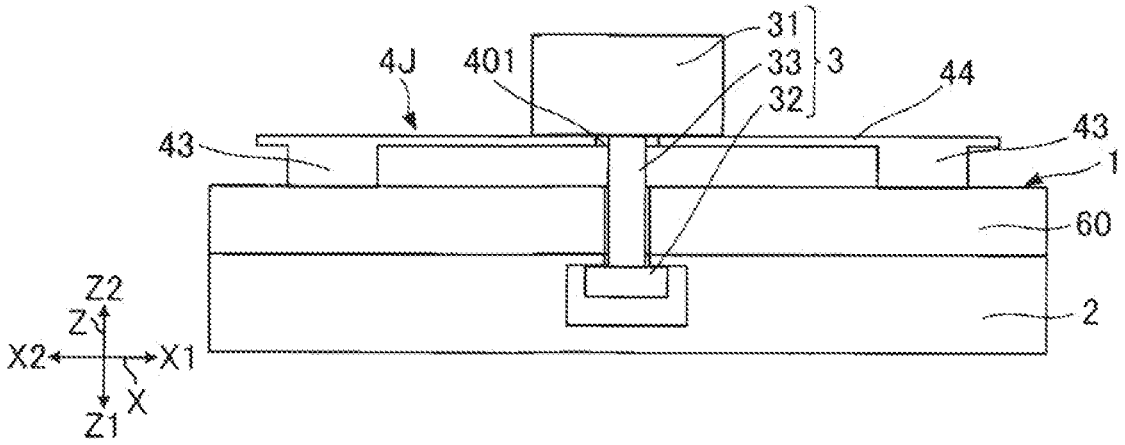


FIG. 33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Z

FIG. 34

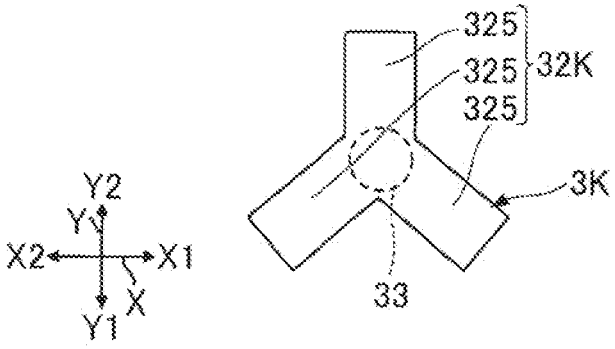
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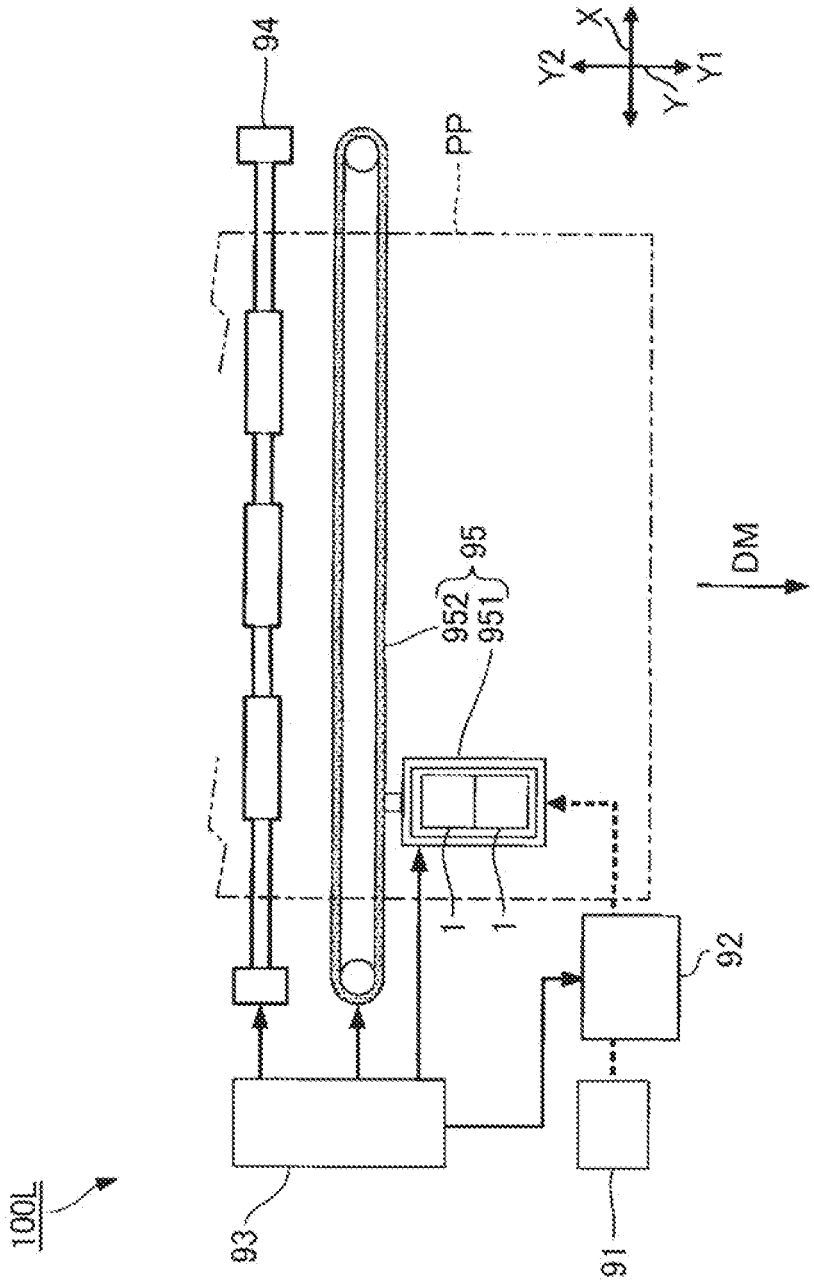
FIG. 35



LIQUID EJECTING APPARATUS AND METHOD OF FIXING LIQUID EJECTING HEAD

The present application is based on, and claims priority from JP Application Serial Number 2021-003211, filed Jan. 13, 2021, the disclosure of which is hereby incorporated by reference herein in its entirety.

BACKGROUND

1. Technical Field

The present disclosure relates to a liquid ejecting apparatus and a method of fixing a liquid ejecting head.

2. Related Art

There has been known a liquid ejecting apparatus as represented by an ink jet printer, which ejects a liquid such as an ink.

A liquid ejecting apparatus described in JP-A-2018-149684 includes head bodies that eject inks and a unit base that holds the head bodies. Each head body is fixed to the unit base through a spacer by using screw members.

However, the method of fixing the head body to the unit base by using the screw members has a problem that it is not easy to attach and replace the head body. To deal with this, there has been a demand for a liquid ejecting apparatus that enables easy fixation of a head body to a unit base.

SUMMARY

A liquid ejecting apparatus according to an aspect of the present disclosure includes a liquid ejecting head that ejects a liquid, a holding member that holds the liquid ejecting head, a fixing member including a head portion, an engaging portion, and a shaft portion that couples the head portion to the engaging portion, and an elastic member including a first opening into which the shaft portion is inserted. One of the liquid ejecting head and the holding member includes a second opening into which the shaft portion is inserted, and the other one of the liquid ejecting head and the holding member includes a first engaged portion to be engaged with the engaging portion. The liquid ejecting head is fixed to the holding member by the engaging portion being brought into engagement with the first engaged portion such that the first opening and the second opening are disposed between the head portion and the engaging portion.

A method of fixing a liquid ejecting head according to an aspect of the present disclosure provides a method of fixing a liquid ejecting head including, fixing a liquid ejecting head to a holding member by using a fixing member including a head portion, an engaging portion, and a shaft portion that couples the head portion to the engaging portion, and an elastic member including a first opening into which the shaft portion is inserted, the elastic member being brought into contact with the head portion. One of the liquid ejecting head and the holding member includes a second opening into which the shaft portion is inserted, and another one of the liquid ejecting head and the holding member includes a first engaged portion to be engaged with the engaging portion. The liquid ejecting head is fixed to the holding member by the engaging portion being brought into engagement with the first engaged portion such that the first opening and the second opening are disposed between the head portion and the engaging portion while the elastic member is pressed with the head portion.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic diagram illustrating a configuration example of a liquid ejecting apparatus according to a first embodiment.

FIG. **2** is a plan view of a head unit in FIG. **1**.

FIG. **3** is a partially enlarged view of the head unit in FIG. **2**.

FIG. **4** is a view corresponding to a cross-section taken along the IV-IV line in FIG. **3**.

FIG. **5** is an exploded perspective view of FIG. **4**.

FIG. **6** is an exploded perspective view of a liquid ejecting head illustrated in FIG. **4**.

FIG. **7** is an enlarged diagram of a fixing member, an elastic member, the liquid ejecting head, and a holding member illustrated in FIG. **5**.

FIG. **8** is an exploded perspective view of the fixing member, the elastic member, the liquid ejecting head, and the holding member illustrated in FIG. **5**.

FIG. **9** is a cross-sectional view of the fixing member, the elastic member, the liquid ejecting head, and the holding member illustrated in FIG. **5**.

FIG. **10** is a cross-sectional view of the fixing member illustrated in FIG. **7**.

FIG. **11** is a plan view of the elastic member illustrated in FIG. **7**.

FIG. **12** is a plan view of a first flange portion included in a holder illustrated in FIG. **7**.

FIG. **13** is a perspective view of an engaged member illustrated in FIG. **7**.

FIG. **14** is a cross-sectional view of the engaged member illustrated in FIG. **7**.

FIG. **15** is a plan view of the engaged member illustrated in FIG. **7**.

FIG. **16** is a diagram for explaining fixation of the elastic member to the liquid ejecting head.

FIG. **17** is another diagram for explaining fixation of the elastic member to the liquid ejecting head.

FIG. **18** is a diagram for explaining fixation of the liquid ejecting head to the holding member.

FIG. **19** is another diagram for explaining fixation of the liquid ejecting head to the holding member.

FIG. **20** is still another diagram for explaining fixation of the liquid ejecting head to the holding member.

FIG. **21** is a perspective view illustrating a fixing member of a second embodiment.

FIG. **22** is a cross-sectional view illustrating a fixing member of a third embodiment.

FIG. **23** is a cross-sectional view illustrating the fixing member of the third embodiment in an exploded state.

FIG. **24** is a diagram schematically illustrating a liquid ejecting head and a holding member of a first modified example.

FIG. **25** is a diagram illustrating a layout of the liquid ejecting head and the holding member of the first embodiment.

FIG. **26** is a diagram schematically illustrating a layout of a liquid ejecting head and a holding member of a second modified example.

FIG. **27** is a diagram schematically illustrating a liquid ejecting head and a holding member of a third modified example.

FIG. **28** is a diagram schematically illustrating a liquid ejecting head and a holding member of a fourth modified example.

FIG. **29** is a diagram schematically illustrating a holding member of a fifth modified example.

FIG. **30** is a diagram schematically illustrating a fixing member and a liquid ejecting head of a sixth modified example.

FIG. **31** is a plan view of the fixing member and a first flange portion of the liquid ejecting head illustrated in FIG. **30**.

FIG. **32** is a diagram schematically illustrating an elastic member of a seventh modified example.

FIG. **33** is a diagram schematically illustrating an elastic member of an eighth modified example.

FIG. **34** is a diagram schematically illustrating a fixing member of a ninth modified example.

FIG. **35** is a schematic diagram illustrating a liquid ejecting apparatus of a tenth modified example.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

Modes for carrying out the present disclosure will be described below with reference to the drawings. It is to be noted, however, that dimensions and scales of constituents in the drawings may be different from reality as appropriate. Moreover, the following embodiments represent preferred specific examples of the present disclosure and are therefore provided with various restrictions which are deemed to be favorable from technical perspectives. However, the scope of the present disclosure is not limited to these embodiments unless there is a specific statement to restrict the scope of the present disclosure in the following description.

The following description will be given by appropriately using the x axis, the y axis, and the z axis which are orthogonal to one another. Meanwhile, one direction along the x axis will be referred to as x**1** direction while a direction opposite to the x**1** direction will be referred to as x**2** direction. Likewise, one direction along the y axis will be referred to as y**1** direction while a direction opposite to the y**1** direction will be referred to as y**2** direction. Moreover, one direction along the z axis will be referred to as z**1** direction while a direction opposite to the z**1** direction will be referred to as z**2** direction. In the meantime, view in the z**1** direction or the z**2** direction will be referred to as "plan view". Meanwhile, view of a section taken along a plane including the z axis in a direction orthogonal to the z axis will be referred to as "cross-sectional view". In the meantime, the direction along the z axis corresponds to a gravitational direction. The z**1** direction corresponds to "downward in the gravitational direction" while the z**2** direction corresponds to "upward in the gravitational direction".

1. First Embodiment

1-1. Overall Configuration of Liquid Ejecting Apparatus **100**

FIG. **1** is a schematic diagram illustrating a configuration example of a liquid ejecting apparatus **100** according to a first embodiment. The liquid ejecting apparatus **100** illustrated in FIG. **1** is a printing apparatus of an ink jet type which ejects an ink as an example of a "liquid" onto a medium PP in the form of droplets. The liquid ejecting apparatus **100** of this embodiment is a printing apparatus of so-called a line type which distributes multiple nozzles for ejecting the ink across an entire range in a width direction of the medium PP. Though the medium PP is typically print paper, a print target of an arbitrary material such as a resin film and a cloth is also used as the medium PP.

The liquid ejecting apparatus **100** illustrated in FIG. **1** includes a circulation mechanism **92**, a control unit **93**, a medium transportation mechanism **94**, and a head unit **10**. The head unit **10** includes liquid ejecting heads **1**. Moreover, a liquid container **91** is installed in the liquid ejecting apparatus **100**.

The liquid container **91** is a liquid storage unit that stores the ink. For example, a cartridge that is attachable to and detachable from the liquid ejecting apparatus **100**, an ink package having a bag shape formed from a flexible film, or an ink-refillable ink tank is used for the liquid container **91**. Any type of the ink may be stored in the liquid container **91**. For example, the liquid container **91** includes multiple sub-containers for storing inks of types different from one another.

The circulation mechanism **92** supplies the ink stored in the liquid container **91** to the liquid ejecting head **1**. To be more precise, the circulation mechanism **92** supplies the ink stored in the liquid container **91** to the liquid ejecting head **1**, and collects the ink discharged from the liquid ejecting head **1** and returns the ink to the liquid ejecting head **1** again. For example, the circulation mechanism **92** includes a flow channel for supplying the ink to the liquid ejecting head **1**, a flow channel for collecting the ink discharged from the liquid ejecting head **1**, a sub-tank for storing the collected ink, a pump for transferring the ink, and the like.

The control unit **93** is a control device that controls operations of respective elements included in the liquid ejecting apparatus **100**. The control unit **93** includes a processing circuit such as a central processing unit (CPU) and a field programmable gate array (FPGA), and a storage circuit such as a semiconductor memory. Various programs and various data are stored in the storage circuit. The processing circuit achieves a variety of control by executing the programs and using the data as appropriate.

The medium transportation mechanism **94** transports the medium PP in a direction of transportation DM by being controlled by the control unit **93**. Here, the direction of transportation DM is the y**1** direction, for example. The direction of transportation DM is not limited only to the y**1** direction, but may also be other directions. The medium transportation mechanism **94** includes a transportation roller that is elongate along the x axis, and a motor that rotates the transportation roller. Note that the medium transportation mechanism **94** is not limited only to the configuration to use the transportation roller. For example, the medium transportation mechanism **94** may be configured to use a drum that transports the medium PP in a state of being stuck to an outer peripheral surface by use of static electricity or the like, or configured to use an endless belt.

The head unit **10** is a line head in which the liquid ejecting heads **1** are arranged along the x axis. The liquid ejecting heads **1** eject the ink from the respective nozzles to the medium PP under the control of the control unit **93**. An image is formed on a surface of the medium PP by ejecting the ink onto the medium PP from the respective liquid ejecting heads **1** in parallel with the transportation of the medium PP by the medium transportation mechanism **94**.

1-2. Head Unit **10**

FIG. **2** is a plan view of the head unit **10** in FIG. **1**. FIG. **3** is a partially enlarged view of the head unit **10** in FIG. **2**.

FIG. **4** corresponds to a cross-section taken along the IV-IV line in FIG. **3**. FIG. **5** is an exploded perspective view of FIG. **4**.

In addition to the liquid ejecting heads **1**, the head unit **10** includes a holding member **2**, fixing members **3**, and elastic members **4** as illustrated in FIGS. **2** to **5**.

1-2a. Holding Member **2**

The holding member **2** illustrated in FIG. **2** is a carriage that holds the liquid ejecting heads **1**. A body portion **21** is an elongate member that extends in the x**1** direction. The material of the body portion **21** is a metal such as aluminum and stainless steel, or a resin. When the head unit **10** is formed into the line head that is elongate in the x**1** direction as discussed in this embodiment, a highly rigid metal material may be used for the body portion **21** so as to avoid deformation even when holding two or more liquid ejecting heads **1**.

The holding member **2** includes the body portion **21** and engaged members **25**. The body portion **21** includes openings H**2**. Each opening H**2** is a wall portion that forms a hole to penetrate the holding member **2**. The openings H**2** are provided one by one to the liquid ejecting heads **1**. The liquid ejecting heads **1** are held by the holding member **2** in the state of being inserted into the respective openings H**2**. In FIG. **2**, illustration of part of the liquid ejecting heads **1** is omitted in order to facilitate the understanding of the openings H**2**.

In the example illustrated in FIG. **2**, the openings H**2** are divided into a first row L**2***a* and a second row L**2***b*, and the openings H**2** in each row are arranged in the x**1** direction. Here, the shape of the holding member **2** is such a shape that is symmetric with respect to the center of the holding member **2** in plan view. Meanwhile, although illustration is omitted, when a surface of a transportation drum for transporting the medium PP has a curved shape, a surface of the holding member **2** opposed to the surface of the transportation drum is slightly inclined so as to trace this surface relative to a plane that has a virtual line extending along the gravitational direction as a normal line, or in other words, a horizontal plane. Likewise, an ejecting surface S**11** of each liquid ejecting head **1** to be described later is slightly inclined relative to the plane that has the virtual line extending along the gravitational direction as the normal line, or in other words, the horizontal plane.

As illustrated in FIGS. **3** and **5**, the body portion **21** is provided with positioning pins **211**. Two positioning pins **211** are provided to each liquid ejecting head **1**. As illustrated in FIG. **5**, the positioning pins **211** project in the z**2** direction from the body portion **21**. The positioning pins **211** are used for positioning the liquid ejecting heads **1** relative to the holding member **2**. As illustrated in FIG. **2**, the positioning pins **211** are provided corresponding to the after-mentioned positioning holes **1521** included in the liquid ejecting head **1**. Here, such positioning holes may be provided to the body portion **21** of the holding member **2** and the corresponding positioning pins may be provided to the liquid ejecting heads **1** instead.

As illustrated in FIG. **5**, the body portion **21** includes a recess **210**. The engaged member **25** is disposed in the recess **210**. The engaged member **25** is used for fixing the liquid ejecting head **1** to the holding member **2**. The engaged member **25** will be described later in detail.

1-2b. Elastic Members **4**

As illustrated in FIG. **2**, two elastic members **4** are provided to each of the liquid ejecting heads **1**. Each elastic member **4** is an elastic plate spring, for example. The elastic members **4** are used for fixing the liquid ejecting heads **1** to the holding member **2**. Although the material of the elastic members **4** is not limited to a particular material, the elastic members **4** are made of a metal such as stainless steel and a nickel alloy, for example. Meanwhile, as illustrated in FIGS. **4** and **5**, the holding member **2** is not disposed sideways of the elastic members **4**, or in other words, at a position in the y**1** direction relative to the elastic members **4**. The holding member **2** is located at a position in the z**2** direction relative to the elastic members **4**. The elastic members **4** will be described later in detail.

1-2c. Fixing Members **3**

The fixing members **3** illustrated in FIGS. **2** to **5** are used for fixing the liquid ejecting heads **1** to the holding member **2**. The use of the fixing members **3** makes it possible to fix the liquid ejecting heads **1** to the holding member **2** easily without using any screws as in the related art. The fixing members **3** will be described later in detail.

1-2d. Liquid Ejecting Head **1**

As illustrated in FIGS. **3** to **5**, the liquid ejecting head **1** has the ejecting surface S**11** provided with the nozzles for ejecting the ink. As illustrated in FIG. **4**, the liquid ejecting head **1** is held by the holding member **2** such that the ejecting surface S**11** is located in the front line in the z**1** direction among the constituents of the head unit **10**.

FIG. **6** is an exploded perspective view of the liquid ejecting head **1** illustrated in FIG. **4**. As illustrated in FIG. **6**, the liquid ejecting head **1** includes an electric coupling portion **11**, a flow channel structure **12**, a wiring substrate **13**, head chips **50**, a fixation plate **14**, and a holder **15**. These elements are stacked on one another and fastened together with screws **19**.

As illustrated in FIG. **6**, the electric coupling portion **11** includes a relay substrate **111**, two connectors **112**, and two covers **113**. The relay substrate **111** is electrically coupled to the head chips **50** through the wiring substrate **13**. The relay substrate **111** is provided with coupling terminals and various wires. The relay substrate **111** is a rigid substrate, for example. The relay substrate **111** is disposed on the wiring substrate **13** such that its plate surface extends in the z**1** direction.

Meanwhile, the connectors **112** are coupled to the relay substrate **111**. The connectors **112** are used for establishing electric coupling to the outside of the liquid ejecting head **1**. Meanwhile, the relay substrate **111** is sandwiched between the two covers **113** and protected by the two covers **113**. One of the two covers **113** covers a surface in the y**1** direction of the relay substrate **111** while the other cover **113** covers a surface in the y**2** direction of the relay substrate **111**.

The flow channel structure **12** is disposed at a position in the z**1** direction relative to the electric coupling portion **11**. The flow channel structure **12** includes flow channel substrates **121**, **122**, **125**, **126**, and **127**. The flow channel substrates **121**, **122**, **125**, **126**, and **127** are arranged in this order in the z**2** direction.

The flow channel substrate **127** is provided with flow channel pipes **129** that project in the z**2** direction. The flow channel pipes **129** are used for coupling with not-illustrated tubes and the like to be coupled to the circulation mechanism **92** illustrated in FIG. **1**. Through holes and recesses are formed in the flow channel substrates **121**, **122**, **125**, and **126**. Flow channels S**12** in which the ink flows are formed

from the through holes and the recesses. The flow channels S12 include flow channels that supply the ink from the circulation mechanism **92** illustrated in FIG. **1** to the head chips **50** illustrated in FIG. **6**, and flow channels that return the ink discharged from the head chips **50** to the circulation mechanism **92**.

Here, the number of the flow channel substrates included in the flow channel structure **12** is not limited to 5. The number of the flow channel substrates may be in a range from 1 to 4 or equal to or above 6. Meanwhile, the material of each of the flow channel substrates **121**, **122**, **125**, **126**, and **127** is one of a metal such as stainless steel (SUS) and aluminum, a ceramic, and a resin such as poly(p-phenylene benzobisoxazole) and polypropylene.

The wiring substrate **13** is disposed between the components of the flow channel structure **12**. In the example illustrated in FIG. **6**, the wiring substrate **13** is disposed between the flow channel substrate **122** and the flow channel substrate **125**. The wiring substrate **13** is a mounted component for electrically coupling the relay substrate **111** to the head chips **50**. The wiring substrate **13** is a rigid substrate, for example. Meanwhile, the wiring substrate **13** is provided with connector **131** which serves as a coupling component to be coupled to the relay substrate **111**.

The head chips **50** are disposed at positions in the z1 direction relative to the flow channel structure **12**. Each head chip **50** includes nozzles. Moreover, each head chip **50** includes a mechanism for ejecting the ink from the nozzles. Specifically, each head chip **50** includes an actuator unit **51** and a wiring member **52**.

The actuator unit **51** includes a nozzle plate provided with the nozzle, a flow channel member includes a flow channel that communicates with the nozzle, a pressure chamber substrate includes a pressure chamber that communicates with the flow channel, a vibration plate for changing a pressure inside the pressure chamber, and a piezoelectric element that vibrates the vibration plate. Meanwhile, the piezoelectric element includes a piezoelectric body and an electrode. The electrode is electrically coupled to the wiring member **52**. In the meantime, the actuator unit **51** forms part of the ejecting surface S11 provided with the nozzle.

The wiring member **52** includes a driving circuit for driving the piezoelectric element included in the actuator unit **51**. The wiring member **52** is a chip on film (COF), for example. The wiring member **52** electrically couples the piezoelectric element included in the actuator unit **51** to the wiring substrate **13**. The piezoelectric element included in the actuator unit **51** is driven in response to a driving signal from the control unit **93** illustrated in FIG. **1**.

As illustrated in FIG. **6**, the fixation plate **14** is a plate-like member for fixing the head chips **50** to the holder **15**. The fixation plate **14** includes openings for exposing the nozzles included in the head chips **50**. A surface in the z1 direction of the fixation plate **14** forms a bottom surface of the liquid ejecting head **1**. The bottom surface forms part of the ejecting surface S11. The ejecting surface S11 is formed from the bottom surface of the fixation plate **14** and a bottom surface of the actuator unit **51**. The material of the fixation plate **14** is a metal such as stainless steel.

The holder **15** is disposed at a position in the z1 direction relative to the flow channel structure **12**. The holder **15** has a prescribed thickness in the z1 direction. The holder **15** holds the fixation plate **14** and the head chips **50**. The material of the holder **15** is stainless steel, for example. Instead, the material of the holder **15** may be any of a metal other than the stainless steel, a resin, and the like.

The holder **15** includes a base portion **151**, a first flange portion **152***a*, and a second flange portion **152***b*. The base portion **151** is a plate-like portion extending along x-y plane. The base portion **151** includes recesses for housing the head chips **50**. Moreover, the base portion **151** includes through holes that continue from the recesses and penetrate the base portion **151** in the z1 direction. The wiring member **52** is inserted into each through hole.

The first flange portion **152***a* is a portion that bulges in the y1 direction from the base portion **151**. The second flange portion **152***b* is a portion that bulges in the y2 direction from the base portion **151**. The first flange portion **152***a* and the second flange portion **152***b* have an elongate shape of which longitudinal direction is in line with the x1 direction. The first flange portion **152***a* and the second flange portion **152***b* are used for fixing the liquid ejecting head **1** to the above-mentioned holding member **2**.

Meanwhile, as illustrated in FIG. **5**, the first flange portion **152***a* includes an opening **101** having a second opening **102**, and a pair of fixation holes **1522**. Details of the second opening **102** will be described later. The opening **101** is disposed between the pair of fixation holes **1522** in the x1 direction.

Meanwhile, as illustrated in FIG. **6**, the second flange portion **152***b* includes an opening **101** having a second opening **102**, a pair of positioning holes **1521**, and a pair of fixation holes **1522**. Then opening **101** is disposed between the pair of fixation holes **1522** in the x1 direction. Meanwhile, the pair of fixation holes **1522** are disposed between the pair of positioning pins **211** in the x1 direction. The positioning holes **1521** are provided corresponding to the positioning pins **211** illustrated in FIG. **3**. The positioning pins **211** are inserted into the respective positioning holes **1521**. Insertion of the positioning pins **211** into the positioning holes **1521** makes it possible to position the liquid ejecting head **1** relative to the holding member **2** before the liquid ejecting head **1** is fixed to the holding member **2**.

This embodiment does not adopt a fastening method by using screws provided with spiral threads for fixation of the liquid ejecting head **1** to the holding member **2**. Accordingly, the fixation holes **1522** are not used in this embodiment. However, by providing the liquid ejecting head **1** with the fixation holes **1522** that allow insertion of the screws as described above, it is possible to apply a fixation method using screw fastening to a holding member that includes threaded grooves unlike the holding member in this embodiment.

1.3. Configuration Concerning Fixation of Liquid Ejecting Head 1 to Holding Member 2

FIG. **7** is an enlarged diagram of the fixing member **3**, the elastic member **4**, the liquid ejecting head **1**, and the holding member **2** illustrated in FIG. **5**. FIG. **8** is an exploded perspective view of the fixing member **3**, the elastic member **4**, the liquid ejecting head **1**, and the holding member **2** illustrated in FIG. **5**. FIG. **9** is a cross-sectional view of the fixing member **3**, the elastic member **4**, the liquid ejecting head **1**, and the holding member **2** illustrated in FIG. **5**. Note that illustration of the fixation holes **1522** will be omitted in FIGS. **7** to **9** as appropriate.

As illustrated in FIGS. **7** to **9**, the elastic member **4**, the liquid ejecting head **1**, and the holding member **2** are arranged in this order in the z1 direction. The liquid ejecting head **1** is fixed to the holding member **2** by using the fixing member **3**. Specifically, the first flange portion **152***a* and the second flange portion **152***b* of the holder **15** included in the

liquid ejecting head **1** are fixed to the engaged member **25** included in the holding member **2**. A description will be given below of the fixing member **3** concerning the fixation of the liquid ejecting head **1** to the holding member **2**, the elastic member **4**, the liquid ejecting head **1**, and the holding member **2** by using the after-mentioned FIGS. **10** to **20** with reference to FIGS. **7** to **9**. Note that the first flange portion **152***a* and the second flange portion **152***b* have the same configuration. Accordingly, details concerning the first flange portion **152***a* will be representatively described below and a description of details concerning the second flange portion **152***b* will be omitted as appropriate.

FIG. **10** is a cross-sectional view of the fixing member **3** illustrated in FIG. **7**. The fixing member **3** illustrated in FIG. **10** is used for fixing the liquid ejecting head **1** to the engaged member **25** of the holding member **2**. The material of the fixing member **3** is a metal such as aluminum and stainless steel.

As illustrated in FIG. **10**, the fixing member **3** includes a head portion **31**, an engaging portion **32**, and a shaft portion **33**. The shaft portion **33** couples the head portion **31** to the engaging portion **32**.

In the example illustrated in FIGS. **7** and **8**, the shape of the head portion **31** is substantially a columnar shape. Instead, the head portion **31** may take on a prismatic shape, for example. The shaft portion **33** is an elongate portion. Meanwhile, the engaging portion **32** is another elongate portion. Here, a length in a longitudinal direction of the engaging portion **32** is smaller than a length in a longitudinal direction of the shaft portion **33**. Moreover, the longitudinal direction of the shaft portion **33** intersects with the longitudinal direction of the engaging portion **32**. In the example illustrated in FIGS. **7** and **8**, the longitudinal direction of the shaft portion **33** is orthogonal to the longitudinal direction of the engaging portion **32**.

The head portion **31** is a portion that comes into contact with the elastic member **4**. In this embodiment, the head portion **31** functions as an operating portion for performing a rotating operation of the fixing member **3** in the x-y plane with respect to the liquid ejecting head **1** when fixing the liquid ejecting head **1**. Meanwhile, engaging portion **32** is a portion to engage with the holding member **2**. In this embodiment, the engaging portion **32** is formed to be fittable into the first flange portion **152***a* and the engaged member **25**, respectively. In a state where the first flange portion **152***a* is fixed to the engaged member **25** as illustrated in FIG. **7**, the engaging portion **32** is fitted into the engaged member **25**. To be more precise, the fixing member **3** is fitted into the engaged member **25** in a state where the elastic member **4** and the first flange portion **152***a* are located between the head portion **31** and the engaging portion **32**. Meanwhile, the shaft portion **33** has a length that corresponds to a length in the z**1** direction of the elastic member **4** and the first flange portion **152***a*.

FIG. **11** is a plan view of the elastic member **4** illustrated in FIG. **7**. The elastic member **4** illustrated in FIG. **11** is a spring member having elasticity. By providing the elastic member **4**, it is possible to increase fixation stability when fixing the liquid ejecting head **1** to the holding member **2** or when using the liquid ejecting apparatus **100** as compared to a case without providing the elastic member **4**.

As illustrated in FIGS. **7** to **9**, and **11**, the elastic member **4** is a plate spring having an elongated flat plate shape, and the elastic member **4** is partially bent. The elastic member **4** comes into contact with the head portion **31** of the fixing member **3** in a state where the liquid ejecting head **1** is fixed to the holding member **2** by using the fixing member **3**.

The elastic member **4** has elasticity. The elastic member **4** includes a base portion **41** and two spring portions **42**. The base portion **41** is a portion located between the two spring portions **42**. The spring portions **42** are elastically deformable along the z axis.

Meanwhile, the base portion **41** includes a first opening **401** into which the shaft portion **33** is inserted. The first opening **401** is a wall portion that forms a hole to penetrate the base portion **41** of the elastic member **4**. As illustrated in FIG. **11**, a shape in plan view of the hole defined by the first opening **401** is a shape in conformity to a longitudinal direction of the elastic member **4**. The hole defined by the first opening **401** corresponds to the shaft portion **33** and the engaging portion **32** of the fixing member **3**, and is formed such that the shaft portion **33** and the engaging portion **32** can be inserted into the hole. Meanwhile, as illustrated in FIGS. **7** and **8**, a shape in plan view of the elastic member **4** corresponds to a shape in plan view of the first flange portion **152***a*. A length in the longitudinal direction of the elastic member **4** is equal to or below a length in a longitudinal direction of the first flange portion **152***a*.

FIG. **12** is a plan view of the first flange portion **152***a* included in the holder **15** illustrated in FIG. **7**. The first flange portion **152***a* illustrated in FIG. **12** is used for fixing the holder **15** of the liquid ejecting head **1** to the engaged member **25**.

As illustrated in FIGS. **7** and **12**, the first flange portion **152***a* of the liquid ejecting head **1** includes the opening **101** into which the shaft portion **33** is inserted. The opening **101** includes the second opening **102** and a second engaged portion **103**.

The second opening **102** is a wall portion that forms a hole to penetrate the first flange portion **152***a*. As illustrated in FIG. **12**, a shape in plan view of the hole defined by the second opening **102** is a shape in conformity to a longitudinal direction of the first flange portion **152***a*. The hole defined by the second opening **102** corresponds to the shaft portion **33** and the engaging portion **32** of the fixing member **3**, and is formed such that the shaft portion **33** and the engaging portion **32** can be inserted into the hole.

As illustrated in FIG. **7**, the second engaged portion **103** is located at a position in the z**2** direction relative to the second opening **102**. The second engaged portion **103** is a wall portion that forms a groove open to a surface in the z**2** direction of the first flange portion **152***a*. The groove defined by the second engaged portion **103** communicates with the hole defined by the second opening **102**. Moreover, as illustrated in FIG. **12**, the groove defined by the second engaged portion **103** extends in the y**1** direction in plan view, and intersects with the hole defined by the second opening **102**. In the example illustrated in FIG. **12**, the groove defined by the second engaged portion **103** is orthogonal to the hole defined by the second opening **102** in plan view.

FIG. **13** is a perspective view of the engaged member **25** illustrated in FIG. **7**. FIG. **14** is a cross-sectional view of the engaged member **25** illustrated in FIG. **7**. FIG. **15** is a plan view of the engaged member **25** illustrated in FIG. **7**. The engaged member **25** illustrated in FIGS. **13** to **15** is a member to be engaged with the engaging portion **32** of the fixing member **3**. The material of the engaged member **25** is aluminum, for example. Here, the material of the engaged member **25** may be either a metal other than aluminum or a resin.

As illustrated in FIGS. **7** and **9**, the engaged member **25** is disposed in the recess **210** of the body portion **21**. A surface in the z**1** direction of the body portion **21** and a surface in the z**1** direction of the engaged member **25** are

located at the same position. Accordingly, a substantially flat surface is formed from the surface in the z1 direction of the body portion **21** and the surface in the z1 direction of the engaged member **25**. As illustrated in FIGS. **14** and **15**, the engaged member **25** includes two screw openings **290** and an opening **201**. The opening **201** is located between the two screw openings **290** in plan view.

The two screw openings **290** are wall portions that form holes to penetrate the engaged member **25**. A screw member **29** is inserted into each screw opening **290**. A tip end of the screw member **29** is inserted into a screw hole formed in the body portion **21**. Accordingly, the engaged member **25** that is provided separately from the body portion **21** is fixed to the body portion **21** by using the screw members **29**. Thus, the engaged member **25** is attachable to and detachable from the body portion **21**. Since the engaged member **25** is attachable and detachable, the engaged member **25** can be replaced easily when the engaged member **25** develops scratches as a consequence of repeating replacement of the liquid ejecting heads **1** or when the engaged member **25** causes ink adhesion and the like.

The opening **201** is a wall portion that forms a hole to penetrate the engaged member **25** in the z1 direction. The opening **201** includes a third opening **202**, a first engaged portion **203**, a fourth opening **204**, a fifth opening **205**, and regulating portions **206**.

As illustrated in FIG. **14**, the third opening **202**, the first engaged portion **203**, the fourth opening **204**, and the fifth opening **205** collectively form part of a hole to penetrate the engaged member **25** in the z1 direction. The third opening **202**, the first engaged portion **203**, the fourth opening **204**, and the fifth opening **205** are arranged in this order in the z1 direction. Respective holes formed by the third opening **202**, the first engaged portion **203**, the fourth opening **204**, and the fifth opening **205** communicate with one another.

As illustrated in FIG. **15**, a shape in plan view of the hole defined by the third opening **202** is a shape in conformity to the y1 direction being a width direction of the engaged member **25**. The hole defined by the third opening **202** corresponds to the shaft portion **33** and the engaging portion **32** of the fixing member **3**, and is formed such that the shaft portion **33** and the engaging portion **32** can be inserted into the hole. Moreover, the hole of the third opening **202** is open in the z2 direction of the engaged member **25**.

As illustrated in FIG. **13**, the first engaged portion **203** is also a groove formed in the engaged member **25**. To be more precise, the first engaged portion **203** is a groove formed in a surface of the third opening **202** on an opposite side from a surface of the third opening **202** opposed to the second opening **102**. The first engaged portion **203** is engaged with the engaging portion **32**. As illustrated in FIG. **15**, a shape in plan view of the groove defined by the first engaged portion **203** is a shape in conformity to a longitudinal direction of the engaged member **25**. The groove defined by the first engaged portion **203** intersects with the hole defined by the third opening **202** in plan view. In the example illustrated in FIG. **13**, the groove defined by the first engaged portion **203** is orthogonal to the hole defined by the third opening **202** in plan view. Moreover, the groove defined by the first engaged portion **203** corresponds to the engaging portion **32** of the fixing member **3**, and is formed such that the engaging portion **32** can be inserted to the groove.

As illustrated in FIGS. **13** and **15**, the hole defined by the fourth opening **204** is open in the y1 direction and the y2 direction of the engaged member **25**. A length in the x1 direction of the hole defined by the fourth opening **204** is larger than a length in the x1 direction of the first engaged portion **203**. Meanwhile, the hole defined by the fifth opening **205** is open in the z1 direction of the engaged member **25** and open in the y1 direction and the y2 direction of the engaged member **25**. A length in the x1 direction of the hole defined by the fifth opening **205** is smaller than a length in the x1 direction of the fourth opening **204**. Here, the fourth opening **204** and the first engaged portion **203** may be collectively regarded as the "first engaged portion", or the fifth opening **205**, the fourth opening **204**, and the first engaged portion **203** may be collectively regarded as the "first engaged portion".

As illustrated in FIGS. **13** and **15**, the two regulating portions **206** are wall portions provided to the fourth opening **204**. One of the two regulating portions **206** is located at a position in the y1 direction relative to the first engaged portion **203** in plan view while the other regulating portion **206** is located at a position in the y2 direction relative to the first engaged portion **203** in plan view. Moreover, the two regulating portions **206** are point-symmetrically disposed with respect to the center in plan view of the groove defined by the first engaged portion **203**. These regulating portions **206** regulate rotation in the x-y plane of the engaging portion **32** of the fixing member **3**.

As described above, the liquid ejecting apparatus **100** includes the liquid ejecting head **1**, the holding member **2**, the elastic member **4**, and the fixing member **3**. Moreover, the liquid ejecting head **1** is fixed to the holding member **2** by the engaging portion **32** being brought into engagement with the first engaged portion **203** such that the first opening **401** included in the elastic member **4** and the second opening **102** included in the liquid ejecting head **1** are disposed between the head portion **31** and the engaging portion **32** included in the fixing member **3**. In this way, it is possible to fix the liquid ejecting head **1** to the holding member **2** easily without using the screws as in the related art. Hence, it is possible to attach and replace the liquid ejecting head **1** easily.

When using the screws as in the related art, it is necessary to conduct three operations at the same time, namely, an operation to press the liquid ejecting head **1** against the holding member **2**, an operation to hold the screws, and an operation to fix the screws with a tool such as a screw driver. In contrast, the user of the fixing member **3** makes it possible to fix the liquid ejecting head **1** to the holding member **2** easily by conducting an operation to rotate the fixing member **3** in the x-y plane while holding the liquid ejecting head **1**. Thus, this embodiment reduces the number of operations as compared to the related art, so that the attachment and replacement of the liquid ejecting head **1** can be carried out easily.

In addition, the liquid ejecting apparatus **100** includes the elastic members **4**. Thus, it is possible to stably fix the liquid ejecting head **1** to the holding member **2** by using elastic force of the elastic members **4** as compared to the case of not providing the elastic members **4**. Accordingly, although the screw fastening of the related art cannot stabilize the liquid ejecting head **1** over time due to loosening of the screws, the fixation using the fixing members **3** can maintain the state of stable fixation of the liquid ejecting head **1** for a long period. Moreover, the use of the fixing members **3** and the elastic members **4** can reduce the number of locations to be fixed. Accordingly, it is possible to significantly reduce time required for the fixation work. Furthermore, it is possible to fix the liquid ejecting head **1** easily to the holding member **2** by using the fixing members **3**. Accordingly, the liquid ejecting head **1** can be fixed to the holding member **2** without dropping the liquid ejecting head **1**, the fixing members **3**,

and the like even in a state where the liquid ejecting head **1** is located below the holding member **2** in the gravitational direction, or in other words, in a state where liquid ejecting head **1** cannot be placed on the holding member **2**.

1-4. Method of Fixing Liquid Ejecting Head **1** to Holding Member **2**

A method of manufacturing the liquid ejecting apparatus **100** includes the steps of preparing the liquid ejecting head **1**, the holding member **2**, the elastic members **4**, and the fixing members **3**, and fixing the liquid ejecting head **1** to the holding member **2**. In the following, a method of fixing the liquid ejecting head **1** to the holding member **2** will be described. The method of fixing the liquid ejecting head **1** to the holding member **2** includes the steps of fixing the elastic member **4** to the liquid ejecting head **1**, and fixing the liquid ejecting head **1** to the holding member **2**.

Each of FIGS. **16** and **17** is a diagram for explaining fixation of the elastic member **4** to the liquid ejecting head **1**. As illustrated in FIG. **16**, the hole defined by the first opening **401** of the elastic member **4** is brought into a state of overlapping the hole defined by the second opening **102** of the liquid ejecting head **1** in plan view to begin with. Then, the engaging portion **32** and the shaft portion **33** of the fixing member **3** are inserted into the first opening **401** and the second opening **102**.

In the state of inserting the shaft portion **33** into the first opening **401** and the second opening **102**, the hole defined by the first opening **401**, the hole defined by the second opening **102**, and the engaging portion **32** overlap one another in plan view. From another point of view, a second position being a rotational position where the engaging portion **32** is insertable into the second opening **102** is the same as a rotational position where the engaging portion **32** is insertable into the first opening **401**. For this reason, the fixing member **3** does not have to be rotated when inserting the fixing member **3** into the first opening **401** and the second opening **102** as illustrated in FIG. **16**. In other words, it is possible to insert the engaging portion **32** of the fixing member **3** easily into the first opening **401** and the second opening **102** without rotating the fixing member **3**.

Next, as illustrated in FIG. **17**, the engaging portion **32** is brought into engagement with the second engaged portion **103** by rotating the fixing member **3** in the x-y plane. In this embodiment, the engaging portion **32** is rotated by 90° in the x-y plane by manipulating the head portion **31**. The first opening **401** and the second opening **102** are located between the head portion **31** and the engaging portion **32** in the state of bringing the engaging portion **32** into engagement with the second engaged portion **103**.

As described above, each of the first flange portion **152***a* and the second flange portion **152***b* of the liquid ejecting head **1** includes the second engaged portion **103** engageable with the engaging portion **32**. Therefore, the elastic member **4** can be fixed to the liquid ejecting head **1** by bringing the engaging portion **32** into engagement with the second engaged portion **103**. Accordingly, the elastic member **4** can be fixed to the liquid ejecting head **1** before fixing the liquid ejecting head **1** to the holding member **2**. In other words, it is possible to bring the second engaged portion **103** of the liquid ejecting head **1** into engagement with the engaging portion **32** before bringing the first engaged portion **203** of the holding member **2** to be described later into engagement with the engaging portion **32**. In this way, the elastic member **4** can be fixed to the liquid ejecting head **1** without dropping any of the liquid ejecting head **1** and the elastic member **4**. Moreover, since the hole of the second opening **102** intersects with the groove of the second engaged portion **103** in plan view as described in this embodiment, the engaging portion **32** can be fitted into the second engaged portion **103**.

Each of FIGS. **18**, **19**, and **20** is a diagram for explaining fixation of the liquid ejecting head **1** to the holding member **2**. As illustrated in FIG. **18**, the elastic member **4**, the liquid ejecting head **1**, and the holding member **2** are lapped over such that the first opening **401** is orthogonal to the third opening **202** in plan view by conducting positioning with the positioning pins **211** in a state where the elastic member **4** is fixed to the liquid ejecting head **1** by using the fixing member **3**. In this lapped state, the engaging portion **32** of the fixing member **3** is inserted into the third opening **202** of the holding member **2** as illustrated in FIG. **18**.

Next, as illustrated in FIG. **19**, the fixing member **3** is pushed straight in the z**2** direction, thereby inserting the shaft portion **33** into the third opening **202** and inserting the engaging portion **32** into the fourth opening **204**.

When the elastic member **4**, the liquid ejecting head **1**, and the holding member **2** are lapped over such that the first opening **401** is orthogonal to the third opening **202** in plan view, the engaging portion **32**, the second engaged portion **103**, and the third opening **202** overlap in plan view. From another point of view, a rotational position where the engaging portion **32** is brought into engagement with the second engaged portion **103** is the same as a first position being a rotational position where the engaging portion **32** is insertable into the third opening **202**. For this reason, the engaging portion **32** can be inserted into the third opening **202** by pushing the fixing member **3** straight in the z**2** direction in the state where the elastic member **4** is fixed to the liquid ejecting head **1** by using the fixing member **3** as illustrated in FIG. **19**. This configuration has good workability.

Next, as illustrated in FIG. **20**, the engaging portion **32** is brought into engagement with the first engaged portion **203** such that the first opening **401** and the second opening **102** are disposed between the head portion **31** and the engaging portion **32** while the elastic member **4** is pressed with the head portion **31**. Specifically, the fixing member **3** is rotated in the x-y plane about the shaft portion **33** as a rotational axis while the elastic member **4** is pressed with the head portion **31**. To be more precise, the fixing member **3** is rotated by 90°. In this way, the liquid ejecting head **1** is fixed to the holding member **2**.

By bringing the engaging portion **32** into engagement with the first engaged portion **203** such that the first opening **401** and the second opening **102** are disposed between the head portion **31** and the engaging portion **32** as described above, it is possible to fix the liquid ejecting head **1** to the holding member **2** easily without using the screws as in the related art. Thus, the liquid ejecting head **1** can be attached or replaced easily. Moreover, since it is only necessary to rotate the fixing member **3** by an angle below 180°, or more specifically equal to or below 90°, this operation greatly saves the labor of a worker.

In particular, the engaging portion **32** is engaged with the first engaged portion **203** by rotating the fixing member **3** in the x-y plane about the shaft portion **33** as the rotational axis in the state where the shaft portion **33** is inserted into the second opening **102** and the third opening **202**. As a consequence, the liquid ejecting head **1** is fixed to the holding member **2**. As described above, the liquid ejecting head **1** can be fixed to the holding member **2** easily by conducting the simple operation to rotate the fixing member **3** in the x-y plane. Thus, this operation greatly saves the labor of the worker.

Moreover, the engaging portion **32** is fitted into the first engaged portion **203** in this embodiment. This configuration can keep the state of engagement of the engaging portion **32** with the first engaged portion **203** from being released by vibration and other factors during printing after the liquid ejecting head **1** is fixed to the holding member **2**. Accordingly, a favorable state of fixation of the liquid ejecting head **1** to the holding member **2** stably continues for a long period.

Meanwhile, as illustrated in FIG. **20**, the second opening **102** is disposed below the holding member **2** in the gravitational direction. Moreover, the direction of insertion of the fixing member **3** is a direction upward from below in the gravitational direction. According to the method of fixing the liquid ejecting head **1** by using the fixing member **3**, it is not necessary to conduct the three operations at the same time unlike the related art, namely, the operation to press the liquid ejecting head **1**, the operation to hold the screws, and the operation to fix the screws with the tool. As a consequence, the liquid ejecting head **1** can be easily fixed to the holding member **2** even in the case of fixing the liquid ejecting head **1** to the holding member **2** upward from below in the gravitational direction, or in other words, in a case of bad workability where the liquid ejecting head **1** cannot be fixed to the holding member **2** while placing the liquid ejecting head **1** on the holding member **2**.

Moreover, as described above, the hole of the third opening **202** included in the holding member **2** intersects with the hole of the second opening **102** included in the liquid ejecting head **1** in plan view. From another point of view, the first position being the rotational position where the engaging portion **32** is insertable into the third opening **202** is different from the second position being the rotational position where the engaging portion **32** is insertable into the second opening **102**. For this reason, by rotating the fixing member **3** to the first position different from the second position, the worker can conduct the operation stably for inserting the fixing member **3** into the third opening **202** because the fixing member **3** does not drop even when the worker does not hold the fixing member **3**. Meanwhile, the engaging portion **32** is located at the first position when the engagement of the engaging portion **32** with the first engaged portion **203** is released by rotating the fixing member **3** in the x-y plane in order to detach the liquid ejecting head **1** from the holding member **2**. Accordingly, it is possible to keep the fixing member **3** from dropping due to the engaging portion **32** passing through the second opening **102** at the time of the release. This effect is particularly prominent in the case of fixing the liquid ejecting head **1** to the holding member **2** upward from below in the gravitational direction as in this embodiment because the fixing member **3** is prone to drop in this case.

Meanwhile, the holding member **2** includes the regulating portions **206** to regulate the rotation of the fixing member **3**. Accordingly, when the fixing member **3** is rotated in the x-y plane, it is possible to bring the engaging portion **32** into engagement with the first engaged portion **203** easily just by releasing the push of the fixing member **3** in the z**1** direction at a position where the engaging portion **32** butts one of the regulating portions **206**.

In the meantime, the head portion **31** includes a groove **311** to which the tool for rotating the fixing member **3** is fitted. Accordingly, the liquid ejecting head **1** can be easily fixed to the holding member **2** by manipulating the fixing member **3** while using the tool such as a screw driver and a wrench having a shape corresponding to the groove **311**. Moreover, the groove **311** is open in the z**1** direction of the head portion **31**. Hence, the liquid ejecting head **1** can be attached or replaced easily by using the tool that extends in the z**1** direction even when there is not an enough space in the x-y plane.

Meanwhile, the elastic members **4** are provided separately from the liquid ejecting head **1** and the holding member **2**. Each elastic member **4** is neither fixed to any of the liquid ejecting head **1** and the holding member **2**, nor fixed by using a component other than the fixing member **3**. Accordingly, the elastic member **4** is easily replaceable when the elastic member **4** is deteriorated by replacing the liquid ejecting heads **1** a number of times, for example. Moreover, since the elastic member **4** is not fixed to the liquid ejecting head **1** or the holding member **2**, it is easier to elastically deform the elastic member **4** and to push the fixing member **3** into the fourth opening **204**. Furthermore, by providing the elastic member **4** separately without fixation to the liquid ejecting head **1**, the elastic member **4** can also be used in another aspect in which the elastic member **4** is provided on the surface on the opposite side of the surface provided with the first flange portion **152***a* and the second flange portion **152***b*. In this way, the layout of the elastic member **4** relative to the first flange portion **152***a* and the second flange portion **152***b* can be changed easily. In this embodiment, the liquid ejecting head **1** is fixed to the holding member **2** from below in the vertical direction. On the other hand, the layout of the elastic member **4** can be easily changed when the liquid ejecting head **1** is fixed to the holding member **2** from above in the vertical direction, for example.

In the meantime, as described above, the length of the shaft portion **33** is set such that the elastic member **4** does not cause plastic deformation. Meanwhile, in the state where the engaging portion **32** is engaged with the first engaged portion **203**, a distance from the surface of the head portion **31** in contact with the elastic member **4** to the second opening **102** is set below an amount of deformation in the z**1** direction of the elastic member **4** when the elastic member **4** is deformed to an upper yield point that represents a limit of elasticity thereof. In this way, it is possible to prevent the elastic member **4** from being plastically deformed even when a load in the z**1** direction is applied to the liquid ejecting head **1** in a case where an externally provided wiring member is inserted in the z**1** direction and coupled to the connector **112** of the liquid ejecting head **1**, for example, and when the elastic member **4** is deformed in the z-axis direction by that load.

Meanwhile, the holder **15** and the holding member **2** are formed from materials having different linear expansion coefficients, respectively. To be more precise, the body portion **21** of the holding member **2** that is elongate in the x-axis direction and the second opening **102** of the holder **15** are formed from materials having different linear expansion coefficients, respectively. Even when the holder **15** or the holding member **2** becomes deformed due to the difference in linear expansion coefficient therebetween, the provision of the elastic member **4** can stably maintain the state of fixation of the liquid ejecting head **1** to the holding member **2** as compared to the case of not providing the elastic member **4**. Thus, the materials of the holder **15** and the holding member **2** can be selected from appropriate materials, respectively. In this way, the degree of design freedom can be improved.

In the meantime, the holding member **2** is located at the position in the z**2** direction relative to the first flange portion **152***a* of the liquid ejecting head **1**. For this reason, it is possible to reduce the holding member **2** in size as compared to the case of locating the holding member **2** sideways of the first flange portion **152***a*.

2. Second Embodiment

A second embodiment will be described. Note that in the following explanations of examples, the elements having the same functions as those of the first embodiment will be denoted by the reference signs used in the description of the first embodiment and detailed explanations thereof will be omitted as appropriate.

FIG. **21** is a perspective view illustrating a fixing member **3**A of the second embodiment. This embodiment is the same as the first embodiment except that the fixing member **3**A is used instead of the fixing member **3**. In the following, features of the fixing member **3**A which are different from those of the fixing member **3** of the first embodiment will be described while omitting the explanations of the same features as appropriate.

The fixing member **3**A illustrated in FIG. **21** includes a head portion **31**A instead of the head portion **31** of the first embodiment. The head portion **31**A is a lever for rotating the fixing member **3**A in the x-y plane. Since the head portion **31**A is the lever, it is possible to fix the liquid ejecting head **1** to the holding member **2** by the fixing member **3**A without using a tool. Accordingly, the liquid ejecting head **1** can be attached and replaced more easily as compared to the case of using the tool.

Specifically, the head portion **31**A of the fixing member **3**A is formed to be rotatable in a direction indicated with an arrow A**11** and in a direction indicated with an arrow A**12** about the shaft portion **33**. For example, the shaft portion **33** of the fixing member **3**A is inserted into the first opening **401** and the second opening **102** in the state of rotating 90° in the A**11** direction from the state of the fixing member **3**A illustrated in FIG. **21**. Next, the engaging portion **32** is brought into engagement with the second engaged portion **103** by rotating the head portion **31**A in the direction indicated with the arrow A**12** from the state after rotating 90° in the A**11** direction from the state of the fixing member **3**A illustrated in FIG. **21**. Then, the engaging portion **32** is brought into engagement with the first engaged portion **203** by pushing the fixing member **3**A in the z**2** direction, and restoring the state of the fixing member **3**A illustrated in FIG. **21** from the state of the fixing member **3**A illustrated in FIG. **21** back to the state of rotating 90° in the A**11** direction by rotating the head portion **31**A in the direction indicated with the arrow A**11**. By carrying out the above-described operations of the head portion **31**A, it is possible to attach and replace the liquid ejecting head **1** easily.

Meanwhile, in the state where the liquid ejecting head **1** is fixed to the holding member **2**, the fixing member **3**A is in the state of being rotated by 90° in the A**11** direction from the state of the fixing member **3**A illustrated in FIG. **21**. This configuration makes it possible to achieve reduction in size of the head unit **10**.

3. Third Embodiment

A third embodiment will be described. Note that in the following explanations of examples, the elements having the same functions as those of the first embodiment will be denoted by the reference signs used in the description of the first embodiment and detailed explanations thereof will be omitted as appropriate.

FIG. **22** is a cross-sectional view illustrating a fixing member **3**B of the third embodiment. FIG. **23** is a cross-sectional view illustrated an exploded state of the fixing member **3**B of the third embodiment. This embodiment is the same as the first embodiment except that the fixing member **3**B is used instead of the fixing member **3**. In the following, features of the fixing member **3**B which are different from those of the fixing member **3** of the first embodiment will be described while omitting the explanations of the same features as appropriate.

As illustrated in FIGS. **22** and **23**, the fixing member **3**B is formed from more than one member. Specifically, the fixing member **3**B includes a first member **301** and a second member **302**. The first member **301** and the second member **302** are separable and assemblable. The first member **301** includes the head portion **31** and a first shaft portion **33**B. The second member **302** includes the engaging portion **32** and a second shaft portion **34**. The "shaft portion" is formed from the first shaft portion **33**B and the second shaft portion **34**. That is to say, in this embodiment, the "shaft portion" is formed from both the first member **301** and the second member **302**.

As illustrated in FIG. **23**, the first shaft portion **33**B includes a tip end portion **331** that is engageable with the second shaft portion **34**. The tip end portion **331** is located at an opposite end from the head portion **31** of the first shaft portion **33**B. A male screw is formed on an outer peripheral surface of the tip end portion **331**, for example. Meanwhile, the second shaft portion **34** is formed to be engageable with the tip end portion **331**. A female screw is formed on an inner peripheral surface of the second shaft portion **34**, for example. The first member **301** is fixed to the second member **302** as illustrated in FIG. **22** by fitting the second member **302** into the first member **301**.

When the liquid ejecting head **1** is fixed to the holding member **2** by using the fixing member **3**B, the first member **301** is fixed to the second member **302** in the state where the "shaft portion" that is formed from the first shaft portion **33**B included in the first member **301** and the second shaft portion **34** included in the second member **302** is inserted into both the first opening **401** and the second opening **102**. Specifically, the first member **301** is fixed to the second member **302** in the state where the "shaft portion" formed from the first shaft portion **33**B and the second shaft portion **34** is inserted into both the first opening **401** and the second opening **102**. Meanwhile, the shapes of the respective holes of the first opening **401** and the second opening **102** are designed in conformity to shapes of the first shaft portion **33**B and the second shaft portion **34**, for example. Moreover, the shapes of the respective holes of the first opening **401** and the second opening **102** are formed into such shapes that block insertion of the engaging portion **32** and the head portion **31**.

Accordingly, unlike the first embodiment, the rotating operation of the fixing member **3**B is not required in a period until the fixing member **3**B is inserted into both the first opening **401** and the second opening **102**. Moreover, since the engaging portion **32** and the head portion **31** have the shapes that cannot be inserted into the respective holes of the first opening **401** and the second opening **102**, the fixing member **3**B and the elastic member **4** are kept from coming off the liquid ejecting head **1** after the first member **301** is fixed to the second member **302**. Accordingly, it is possible to prevent the fixing member **3**B and the elastic member **4** from dropping in the course of fixation of the liquid ejecting head **1**. Moreover, the shapes of the respective holes of the first opening **401** and the second opening **102** can be designed in conformity to the shapes of the first shaft portion **33**B and the second shaft portion **34**. To be more precise, the respective holes can be formed into circular holes in conformity to transverse sectional shapes of the first shaft portion **33**B and the second shaft portion **34**, for example. As

a consequence, it is possible to process the respective members easily and to improve mechanical strengths of the respective members, or of the elastic member **4** in particular.

Note that the method of fixing the first member **301** to the second member **302** is not limited only to screw fastening and the fixing method may adopt adhesion or press fitting, for example.

Although the "shaft portion" is formed from both the first member **301** and the second member **302** in this embodiment, the "shaft portion" may be formed from only one of the first member **301** and the second member **302**. Specifically, although the "shaft portion" is formed from the first shaft portion **33**B and the second shaft portion **34** in this embodiment, the "shaft portion" may be formed from only one of the first shaft portion **33**B and the second shaft portion **34**. For example, when a male screw is formed at an end portion of the second shaft portion **34** of the second member **302** on the opposite side of the engaging portion **32**, and the fixing member **3**B is formed by bringing the male screw into engagement with a female screw formed inside the head portion **31**, the first member **301** does not include the first shaft portion **33**B to serve as part of the "shaft portion". Accordingly, the "shaft portion" is formed only from the second shaft portion **34** of the second member **302**. In other words, the "shaft portion" is formed only from the second member **302** out of the first member **301** and the second member **302**.

4. Modified Examples

The above-described embodiments may be modified in various modes. Specific aspects of modifications applicable to the above-described embodiments will be discussed below as examples. Two or more aspects selected arbitrarily from the following examples may be combined as appropriate so far as those aspects do not conflict with one another.

4-1. First Modified Example

FIG. **24** is a diagram schematically illustrating a liquid ejecting head **1**C and a holding member **2**C according to a first modified example. In the above-described embodiments, the first flange portion **152***a* included in the liquid ejecting head **1** is located at the position in the z**1** direction relative to the holding member **2**. Meanwhile, in the example illustrated in FIG. **24**, the first flange portion **152***a* is located at a position in the z**2** direction relative to part of the holding member **2**.

In this case, the holding member **2**C includes a second opening **271** and a second engaged portion **272**. The second opening **271** has a structure, functions, and effects which are the same as those of the second opening **102** of the first embodiment. The second engaged portion **272** has a structure, functions, and effects which are the same as those of the second engaged portion **103** of the first embodiment. Meanwhile, the liquid ejecting head **1**C includes a third opening **171** and a first engaged portion **172**. The third opening **171** has a structure, functions, and effects which are the same as those of the third opening **202** of the first embodiment. The first engaged portion **172** has a structure, functions, and effects which are the same as those of the first engaged portion **203** of the first embodiment.

Accordingly, in the first modified example as well, the liquid ejecting head **1**C is fixed to the holding member **2**C by the engaging portion **32** being brought into engagement with the first engaged portion **172** of the liquid ejecting head **1**C such that the first opening **401** included in the elastic member **4** and the second opening **271** included in the holding member **2**C are disposed between the head portion **31** and the engaging portion **32** included in the fixing member **3** as with the first embodiment.

Note that both a longitudinal direction of the first engaged portion **172** and a longitudinal direction of the second engaged portion **272** are illustrated in line with the x**1** direction for facilitating the understanding of the description in FIG. **24**. Nonetheless, as with the above-described embodiments, the longitudinal direction of the first engaged portion **172** may intersect with the longitudinal direction of the second engaged portion **272** in order to prevent the fixing member **3** from dropping.

4-2. Second Modified Example

FIG. **25** is a diagram illustrating a layout of the liquid ejecting head **1** and the holding member **2** of the first embodiment. FIG. **26** is a diagram illustrating a layout of a liquid ejecting head **1**D and a holding member **2**D of a second modified example. In the first embodiment, the holding member **2** is located at the position in the z**2** direction relative to the first flange portion **152***a* as illustrated in FIG. **25**. In this case, the fixing member **3** is attached to the liquid ejecting head **1** and the holding member **2** upward from below in the gravitational direction. On the other hand, when part of the holding member **2** is located at a position in the z**1** direction relative to the first flange portion **152***a* of the liquid ejecting head **1**D as illustrated in FIG. **26**, the fixing member **3** may be attached to the liquid ejecting head **1** and the holding member **2** from above downward in the gravitational direction.

Moreover, since the holding member **2** is located at the position in the z**2** direction relative to the first flange portion **152***a* as illustrated in FIG. **25**, the holding member **2** is not disposed sideways of the second opening **102**. Since the holding member **2** is located at the position in the z**2** direction relative to the first flange portion **152***a*, it is easier to reduce the size of the liquid ejecting head **1** as compared to the example illustrated in FIG. **26**. Since a space inside the holding member **2** can be reduced as illustrated in FIG. **25**, it is easier to reduce the size of the liquid ejecting head **1**. Moreover, by fixing the fixing member **3** upward from below in the gravitational direction, a distance between the ejecting surface S**11** and the fixing member **3** is reduced. Thus, it is possible to improve positional accuracy of the nozzles.

4-3. Third Modified Example

FIG. **27** is a diagram schematically illustrating a liquid ejecting head **1**E and a holding member **2**E of a third modified example. In the example illustrated in FIG. **27**, the holding member **2**E is located above the first flange portion **152***a* and the base portion **151** in the gravitational direction. In the case of this example, the fixing member **3** can be attached to the liquid ejecting head **1**E and the holding member **2**E from above downward in the gravitational direction.

In this case, the holding member **2**E includes a second opening **273**. The second opening **273** has a structure, functions, and effects which are the same as those of the second opening **102** of the first embodiment. Here, the "second engaged portion" may be omitted when the liquid ejecting head **1**E is fixed to the holding member **2**E from above downward in the gravitational direction. Meanwhile, the liquid ejecting head **1**E includes a third opening **173** and a first engaged portion **174**. The third opening **173** has a

structure, functions, and effects which are the same as those of the third opening **202** of the first embodiment. The first engaged portion **174** has a structure, functions, and effects which are the same as those of the first engaged portion **203** of the first embodiment.

4-4. Fourth Modified Example

FIG. **28** is a diagram schematically illustrating a liquid ejecting head **1**F and a holding member **2**F of a fourth modified example. In the example illustrated in FIG. **28**, the holding member **2**F is located above the base portion **151** in the gravitational direction and is located below the first flange portion **152***a* in the gravitational direction. In the case of this example, the fixing member **3** can be attached to the liquid ejecting head **1**F and the holding member **2**F from above downward in the gravitational direction.

In this case, the liquid ejecting head **1**F includes a second opening **175**. The second opening **175** has a structure, functions, and effects which are the same as those of the second opening **102** of the first embodiment. Here, the "second engaged portion" may be omitted when the liquid ejecting head **1**F is fixed to the holding member **2**F from above downward in the gravitational direction. Meanwhile, the holding member **2**F includes a third opening **274** and a first engaged portion **275**. The third opening **274** has a structure, functions, and effects which are the same as those of the third opening **202** of the first embodiment. The first engaged portion **275** has a structure, functions, and effects which are the same as those of the first engaged portion **203** of the first embodiment.

4-5. Fifth Modified Example

FIG. **29** is a diagram schematically illustrating a holding member **2**G of a fifth modified example. As illustrated in FIG. **29**, the holding member **2**G further includes a second engaged portion **177** in addition to the second opening **102** and the second engaged portion **103**. In other words, the holding member **2**G includes two "second engaged portions". The second engaged portion **103** is located at a position in the z**2** direction of the second opening **102** and the second engaged portion **177** is located at a position in the z**1** direction of the second opening **102**. Accordingly, in the example illustrated in FIG. **29**, the "second engaged portions" are provided in two surfaces of the second opening **102**. For this reason, it is possible to insert the fixing member **3** into the second opening **102** of the holding member **2**G upward from below in the gravitational direction as illustrated in FIG. **29**, and also to insert the fixing member **3** into the second opening **102** of the holding member **2**G from above downward in the gravitational direction. Hence, the direction of insertion of the fixing member **3** can be changed easily depending on a layout relation between the liquid ejecting head **1** and the holding member **2**G.

4-6. Sixth Modified Example

FIG. **30** is a diagram schematically illustrating a fixing member **3**H and a liquid ejecting head **1**H of a sixth modified example. FIG. **31** is a plan view of the fixing member **3**H and the first flange portion **152***a* of the liquid ejecting head **1**H illustrated in FIG. **30**. In the example illustrated in FIG. **30**, an engaging portion **32**H included in the fixing member **3**H also functions as the operating portion for performing the rotating operation of the fixing member **3**H in the x-y plane with respect to the liquid ejecting head **1**H when fixing the liquid ejecting head **1**H. Here, the head portion **31** comes into contact with the elastic member **4**.

Moreover, the liquid ejecting head **1**H includes a first engaged portion **178** to be engaged with the engaging portion **32**H. The first engaged portion **178** is a protrusion that protrudes in the z**2** direction from the first flange portion **152***a*.

Meanwhile, the second opening **102** of the liquid ejecting head **1**H is configured such that the engaging portion **32**H can be inserted into the opening. As illustrated in FIG. **31**, the engaging portion **32**H is rotatable in a direction indicated with an arrow A**21** and a direction indicated with an arrow A**22**.

For example, the engaging portion **32**H in a state of being located in the second opening **102** is rotated in the direction indicated with the arrow A**21**, thus locating the engaging portion **32**H at a position indicated in FIG. **31**. Then, the engaging portion **32**H is brought into engagement with the first engaged portion **178** of the liquid ejecting head **1**H as illustrated in FIGS. **30** and **31**. Accordingly, in the sixth modified example as well, the liquid ejecting head **1**H is fixed to the holding member **2** by the engaging portion **32**H being brought into engagement with the first engaged portion **178** such that the first opening **401** and the third opening **202** are disposed between the head portion **31** and the engaging portion **32**H included in the fixing member **3**H as with the first embodiment.

4-7. Seventh Modified Example

FIG. **32** is a diagram schematically illustrating an elastic member **41** of a seventh modified example. The elastic member **41** illustrated in FIG. **32** is a spring member having a flat plate shape without any bent portion. Meanwhile, the liquid ejecting head **1**H includes protrusions **154** that protrude in the z**2** direction from the first flange portion **152***a*. The elastic member **41** is disposed on the protrusions **154**. The use of the elastic member **41** can improve the positional accuracy of the liquid ejecting head **1**H relative to the holding member **2** as compared to the case of using the elastic member **4** of the first embodiment.

4-8. Eighth Modified Example

FIG. **33** is a diagram schematically illustrating an elastic member **4**J of an eighth modified example. The elastic member **4**J illustrated FIG. **33** includes a flat plate portion **44** having a flat plate shape without any bent portion, and protrusions **43** that protrude in the z**1** direction from the flat plate portion **44**. The protrusions **43** come into contact with the liquid ejecting head **1**. The use of the elastic member **4**J can improve the positional accuracy of the liquid ejecting head **1** relative to the holding member **2** as compared to the case of using the elastic member **4** of the first embodiment.

4-9. Ninth Modified Example

FIG. **34** is a plan view schematically illustrating a fixing member **3**K of a ninth modified example. In the example illustrated in FIG. **34**, an engaging portion **32**K of the fixing member **3**K includes three projections **325** that extend in the x-y plane from the shaft portion **33** in plan view.

A shape of this "engaging portion" may take on any shape as long as the shape is engageable with the "first engaged portion". Nevertheless, by proving the engaging portion **32**K with the projections **325** as illustrated in FIG. **34**, it is possible to reduce a rotation angle of the fixing member **3** in

the x-y plane as compared to the engaging portion **32** of the first embodiment. In the first embodiment, the fixing member **3** is rotated by 90° when fixing the liquid ejecting head **1** to the holding member **2**. In contrast, the use of the fixing member **3**K illustrated in FIG. **34** can reduce the rotation angle of the fixing member **3**K to 60°, for example. Thus, the liquid ejecting head **1** can be fixed to the holding member **2** more easily.

In the meantime, the "shaft portion" may also take on a shape in plan view other than the circular shape as long as such a shape does not affect the functions of the shaft portion. Moreover, the "head portion" may also take on a shape in plan view other than the circular shape as long as such a shape does not affect the functions of the head portion.

4-10. Tenth Modified Example

FIG. **35** is a schematic diagram illustrating a liquid ejecting apparatus **100**L of a tenth modified example. The liquid ejecting apparatus **100**L illustrated in FIG. **35** is a printing apparatus of a serial type. The liquid ejecting apparatus **100**L includes the liquid ejecting heads **1** arranged in the direction of transportation DM of the medium PP. The liquid ejecting heads **1** are arranged in the x-axis direction.

The liquid ejecting apparatus **100**L includes a head transportation mechanism **95**. The head transportation mechanism **95** includes a carriage **951** and an endless belt **952**. The carriage **951** holds liquid ejecting heads **1**. The carriage **951** is coupled to the endless belt **952**. The carriage **951** is transported by the endless belt **952** so as to reciprocate in a main scanning direction.

When a printing operation is executed, the liquid ejecting apparatus **100**L ejects the ink from the liquid ejecting heads **1** while reciprocating the liquid ejecting heads **1** in the main scanning direction and transporting the medium PP in a vertical scanning direction being intersecting with the main scanning direction at the same time. As a consequence, dots corresponding to print data are formed on the medium PP and an image is thus printed on the medium PP.

The liquid ejecting heads **1** are also applied to the above-described liquid ejecting apparatus **100**L of the serial type.

4-11. Other Modified Examples

In the above-described embodiments, the groove **311** is formed at the head portion **31** of the fixing member **3**. Here, a shape of the groove **311** is not limited to a particular shape. For example, the groove **311** may take on a polygonal shape such as a rectangle and a hexagon, a cross shape, an I-shape, and the like.

Meanwhile, the elastic member **4** is the plate spring in the above-described embodiments. Instead, the elastic member **4** may be any of a coil spring, a disc spring, and a waved washer, for example. Nonetheless, the use of the plate spring can easily shorten the distance between the fixing member **3** and the liquid ejecting head **1** as compared to the case of using the coil spring. Here, an attempt to dispose the first flange portion **152***a* close to the ejecting surface S**11** in order to improve the positioning accuracy results in the reduced distance from the ejecting surface S**11** to the first flange portion **152***a* in a direction of ejection. In this case, it is difficult to use the coil spring that requires a certain dimension in the z**1** direction which is the direction of ejection. In contrast, the plate spring bears a high load and requires a small dimension in the direction of ejection, and is therefore suitable.

In the above-described embodiments, the second flange portion **152***b* includes the two positioning holes **1521**. Instead, the two positioning holes **1521** may be provided to the first flange portion **152***a*. In this case, the elastic member **4** is disposed between the two positioning holes **1521** in plan view.

In the above-described embodiments, the engaged member **25** is provided with the regulating portions **206**. However, the engaged member **25** does not always have to be provided with the regulating portions **206**. In this way, it is possible to rotate the fixing member **3** in both a clockwise direction and a counterclockwise direction in the x-y plane.

It is to be understood that the above-described embodiments merely illustrate representative modes of the present disclosure and that the present disclosure is not limited only to the above-described embodiments. Various alterations and additions are possible within the scope not departing from the gist of the present disclosure.

Besides the apparatus dedicated to printing, the liquid ejecting apparatuses shown as the examples in the above-described aspects may also be adopted as various apparatuses including a facsimile apparatus, a copier, and the like. As a matter of fact, the usage of the liquid ejecting apparatus is not limited only to printing. For example, a liquid ejecting apparatus that ejects a solution of a coloring material is used as a manufacturing apparatus for forming a color filter of a display device such as a liquid crystal display panel. Meanwhile, a liquid ejecting apparatus that ejects a solution of a conductive material is used as a manufacturing apparatus for forming wiring and electrodes on a wiring board. In the meantime, a liquid ejecting apparatus that ejects a solution of an organic substance related to a biological object is used as a manufacturing apparatus for manufacturing a biochip, for instance.

What is claimed is:

1. A liquid ejecting apparatus comprising:
- a liquid ejecting head configured to eject a liquid;
- a holding member holding the liquid ejecting head;
- a fixing member including a head portion, an engaging portion, and a shaft portion that couples the head portion to the engaging portion; and
- an elastic member including a first opening into which the shaft portion is inserted, wherein
- one of the liquid ejecting head and the holding member includes a second opening into which the shaft portion is inserted, and another one of the liquid ejecting head and the holding member includes a first engaged portion to be engaged with the engaging portion, and
- the liquid ejecting head is fixed to the holding member by the engaging portion being brought into engagement with the first engaged portion such that the first opening and the second opening are disposed between the head portion and the engaging portion.

2. The liquid ejecting apparatus according to claim **1**, wherein
- the other one of the liquid ejecting head and the holding member includes a third opening into which the shaft portion and the engaging portion are inserted, and
- the liquid ejecting head is fixed to the holding member by the fixing member being rotated about the shaft portion as a rotational axis in a state where the shaft portion is inserted into the third opening.

3. The liquid ejecting apparatus according to claim **2**, wherein
- the first engaged portion forms a groove open to a surface of the third opening opposite from a surface of the third opening facing the second opening, and

the engaging portion is fitted into the first engaged portion by the fixing member being rotated about the shaft portion as the rotational axis.

4. The liquid ejecting apparatus according to claim **2**, wherein

a first position being a rotational position where the engaging portion is configured to be inserted into the third opening is different from a second position being a rotational position where the engaging portion is configured to be inserted into the second opening.

5. The liquid ejecting apparatus according to claim **4**, wherein

the second position is identical to a rotational position where the engaging portion is configured to be inserted into the first opening.

6. The liquid ejecting apparatus according to claim **1**, wherein

the one of the liquid ejecting head and the holding member includes a second engaged portion configured to be engaged with the engaging portion.

7. The liquid ejecting apparatus according to claim **6**, wherein

the one of the liquid ejecting head and the holding member further includes another second engaged portion,

the second engaged portion being provided on a first side of the second opening and the other second engaged portion being provided on a second side of the second opening opposite from the first side of the second opening.

8. The liquid ejecting apparatus according to claim **6**, wherein

a rotational position where the engaging portion is brought into engagement with the second engaged portion is identical to the first position.

9. The liquid ejecting apparatus according to claim **1**, wherein

the other one of the liquid ejecting head and the holding member includes a regulating portion that regulates rotation of the fixing member.

10. The liquid ejecting apparatus according to claim **1**, wherein

the head portion includes any of a hole and a groove to be fitted to a tool to rotate the fixing member.

11. The liquid ejecting apparatus according to claim **1**, wherein

the head portion is a lever to rotate the fixing member.

12. The liquid ejecting apparatus according to claim **1**, wherein

the fixing member includes

a first member including the head portion, and

a second member including the engaging portion, and

the first member is fixed to the second member in a state where the shaft portion formed from at least one of the first member and the second member is inserted into both the first opening and the second opening.

13. The liquid ejecting apparatus according to claim **1**, wherein

the elastic member is provided separately from the liquid ejecting head and the holding member.

14. The liquid ejecting apparatus according to claim **1**, wherein

the second opening of the liquid ejecting head and the holding member are formed from materials having different linear expansion coefficients.

15. The liquid ejecting apparatus according to claim **1**, wherein

the liquid ejecting head includes the second opening,

the second opening is disposed below the holding member in a gravitational direction, and

a direction of insertion of the fixing member is a direction upward from below in the gravitational direction.

16. A method of fixing a liquid ejecting head comprising:

fixing a liquid ejecting head to a holding member by using

a fixing member including a head portion, an engaging portion, and a shaft portion that couples the head portion to the engaging portion, and

an elastic member including a first opening into which the shaft portion is inserted, the elastic member being brought into contact with the head portion, wherein

one of the liquid ejecting head and the holding member includes a second opening into which the shaft portion is inserted, and another one of the liquid ejecting head and the holding member includes a first engaged portion to be engaged with the engaging portion, and

the liquid ejecting head is fixed to the holding member by the engaging portion being brought into engagement with the first engaged portion such that the first opening and the second opening are disposed between the head portion and the engaging portion while the elastic member is pressed with the head portion.

17. The method of fixing a liquid ejecting head according to claim **16**, wherein

a direction of insertion of the fixing member when the liquid ejecting head is fixed to the holding member is a direction upward from below in a gravitational direction, and

before the engaging portion is brought into engagement with the first engaged portion, the fixing member is inserted into the first opening and the second opening and then the fixing member is rotated about the shaft portion as a rotational axis.

18. The method of fixing a liquid ejecting head according to claim **17**, wherein

the one of the liquid ejecting head and the holding member includes a second engaged portion to be engaged with the engaging portion, and

the engaging portion is brought into engagement with the second engaged portion before the engaging portion is brought into engagement with the first engaged portion.

19. The method of fixing a liquid ejecting head according to claim **16**, wherein

the fixing member includes

a first member including the head portion, and

a second member including the engaging portion, and

before the engaging portion is brought into engagement with the first engaged portion, the first member is fixed to the second member in a state where the shaft portion formed from at least one of the first member and the second member is inserted into both the first opening and the second opening.

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